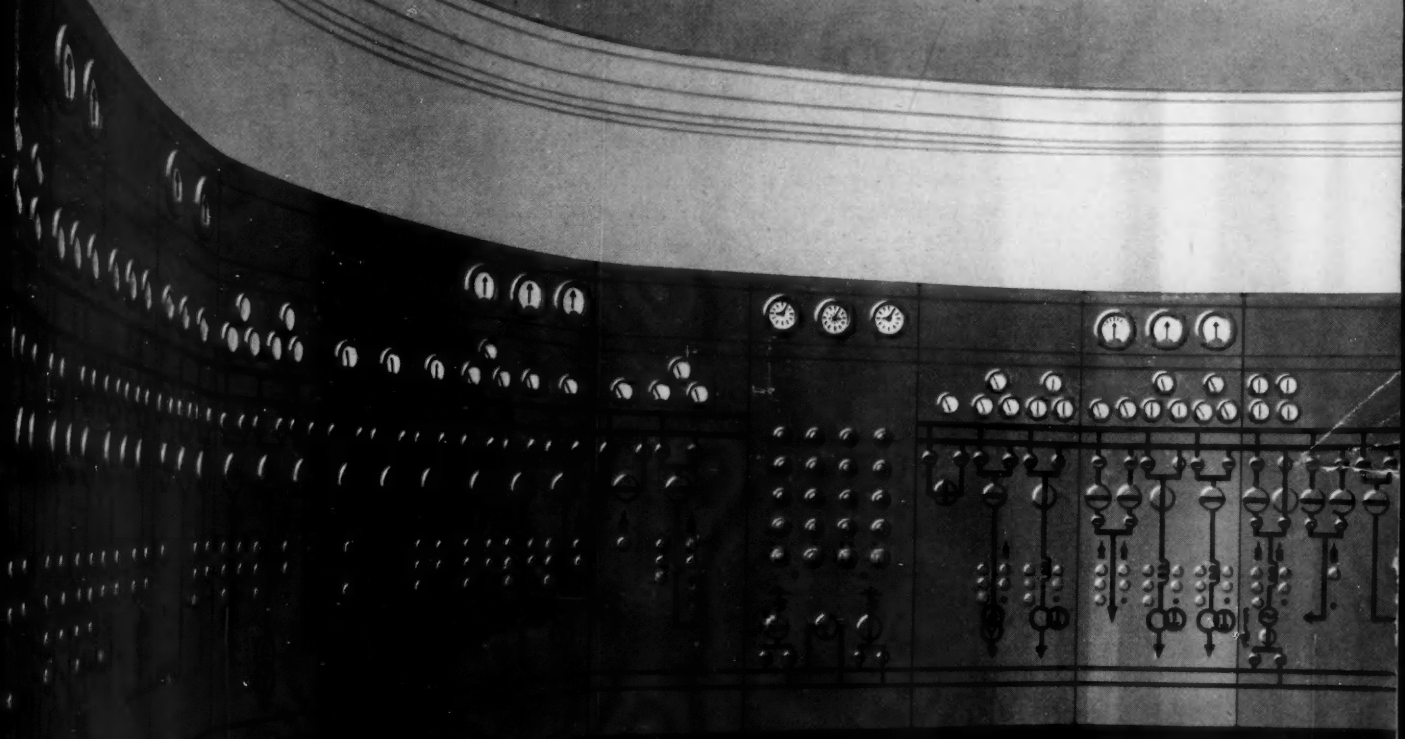
14 JANUARY 1954 NINEPENCE

ELECTRICAL TIMES



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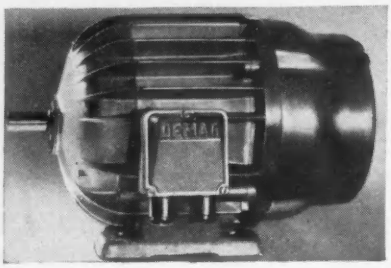

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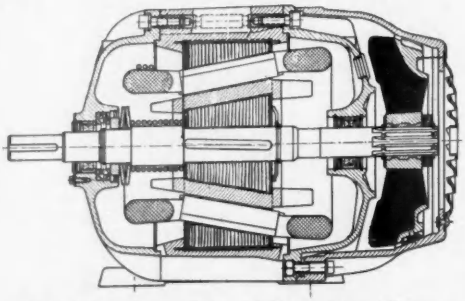

The Brake is an Integral Part of the Motor

0·55 h.p. to 46 h.p. with automatic brake release device, as an optional extra, great variety of frame mountings—horizontal and vertical foot and flange types.

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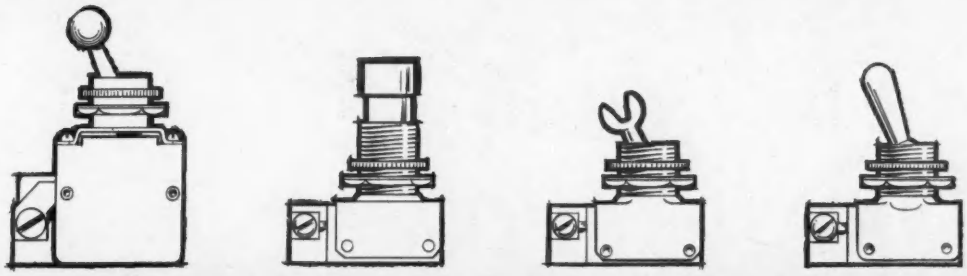

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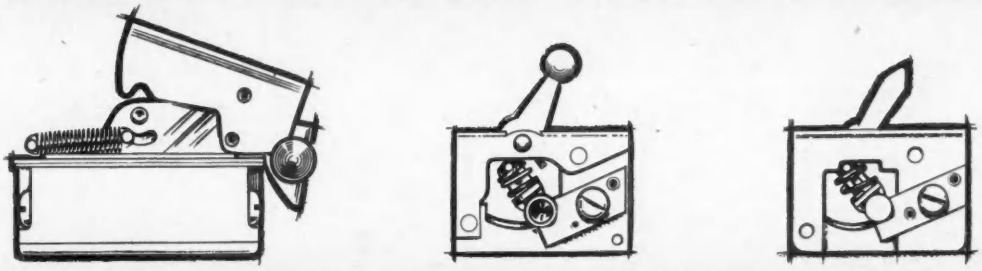
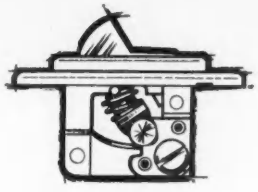
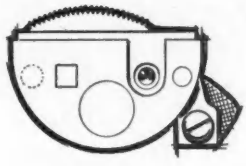
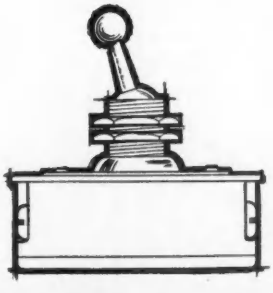


SWITCHES by







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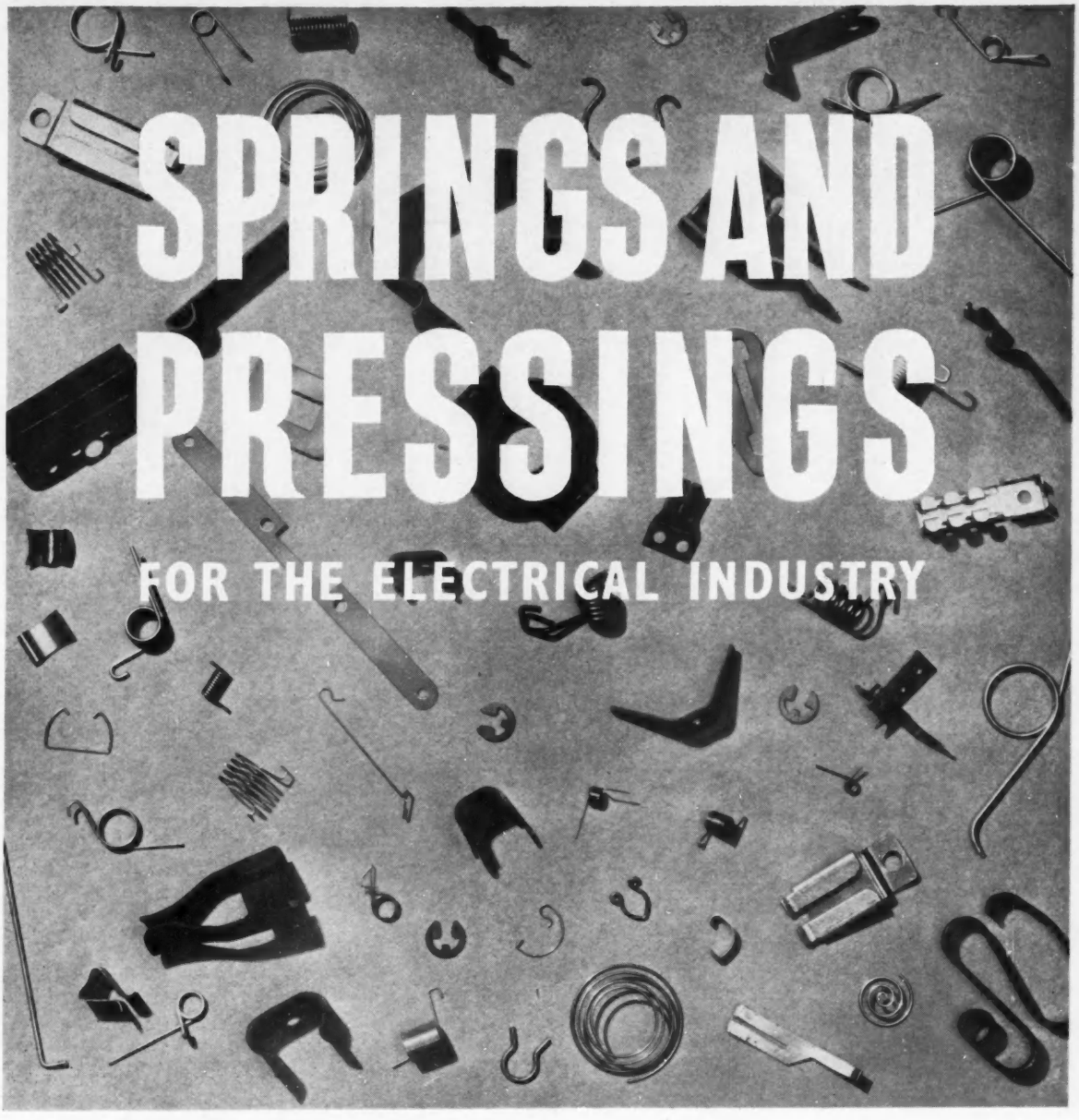

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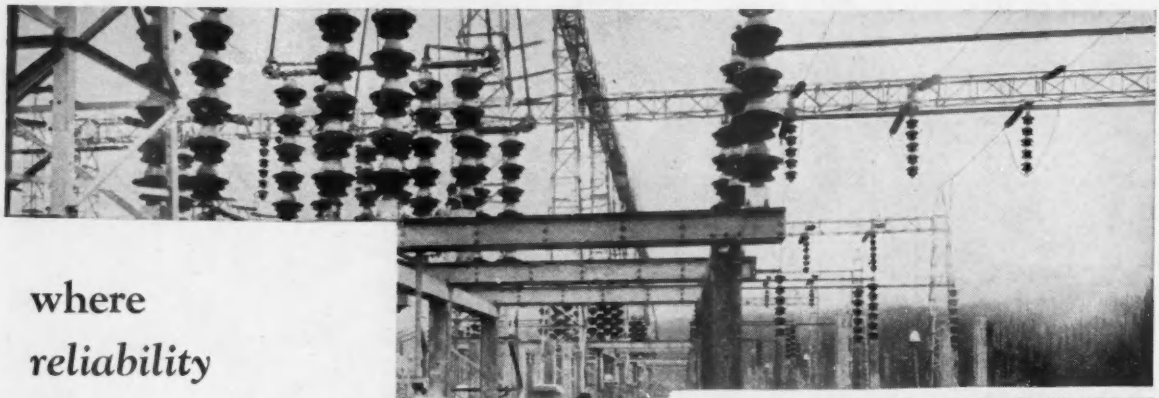

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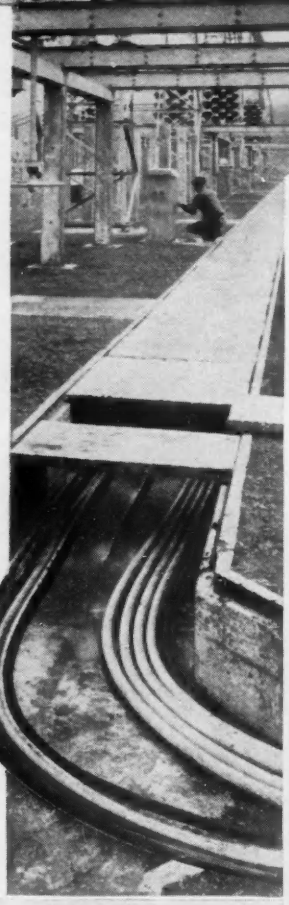

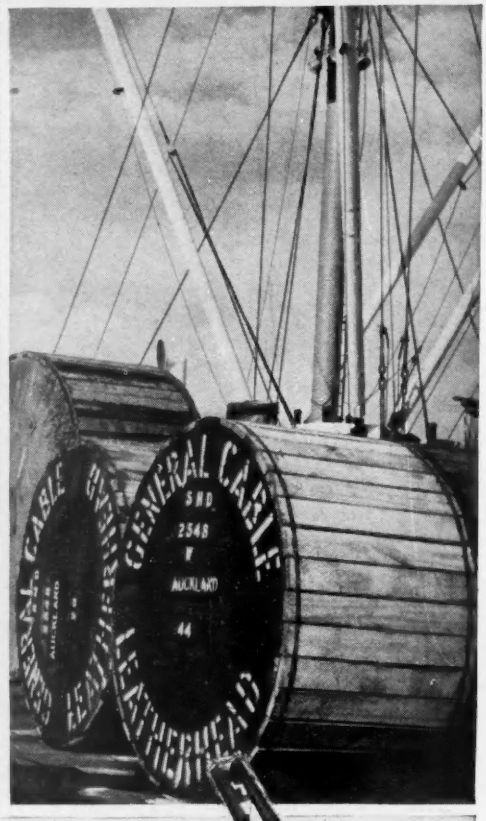

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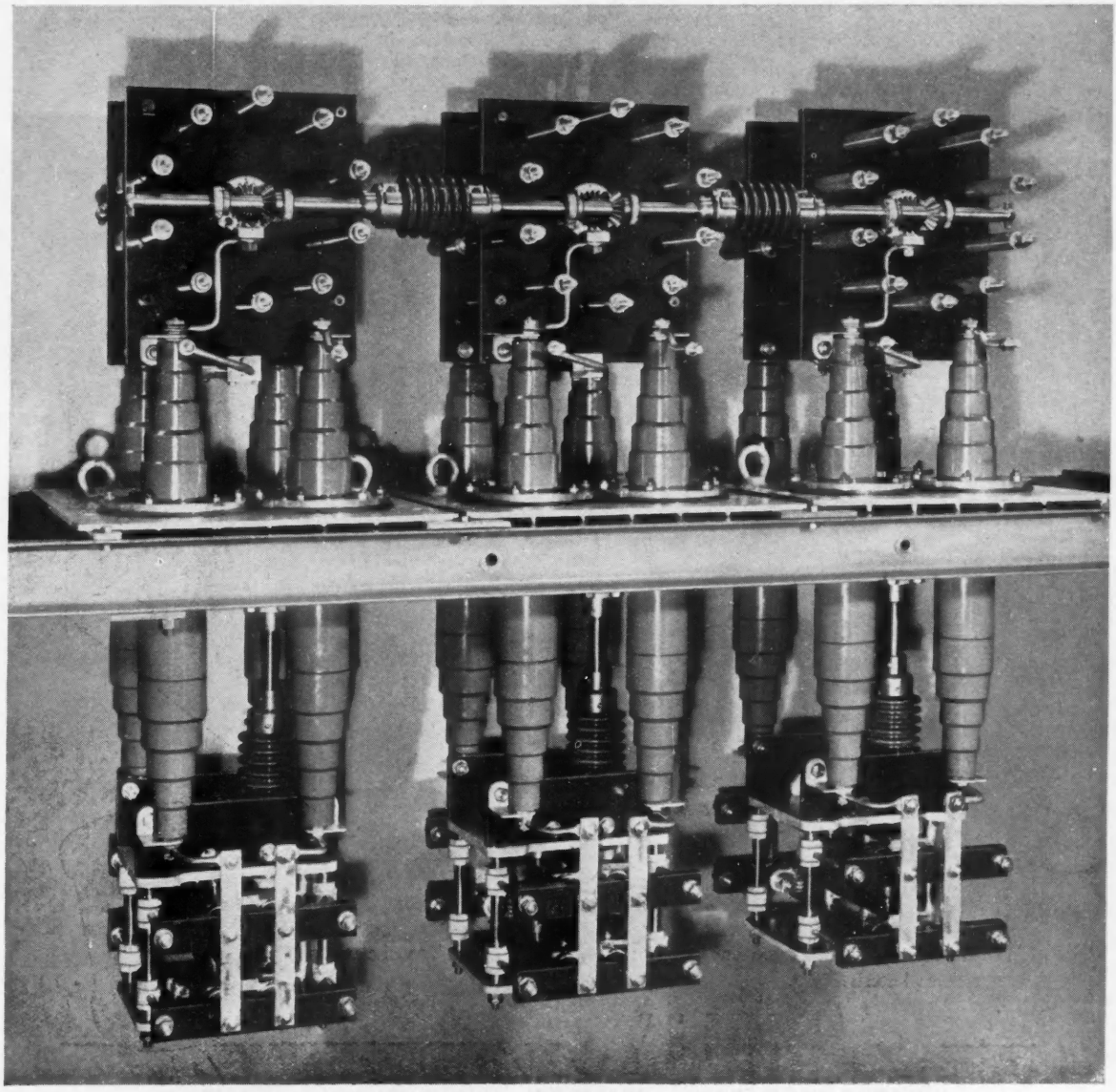

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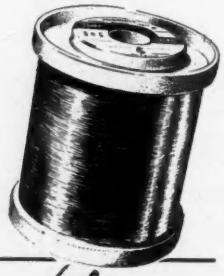

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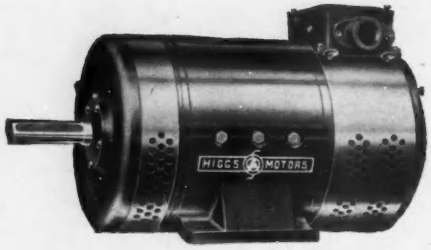

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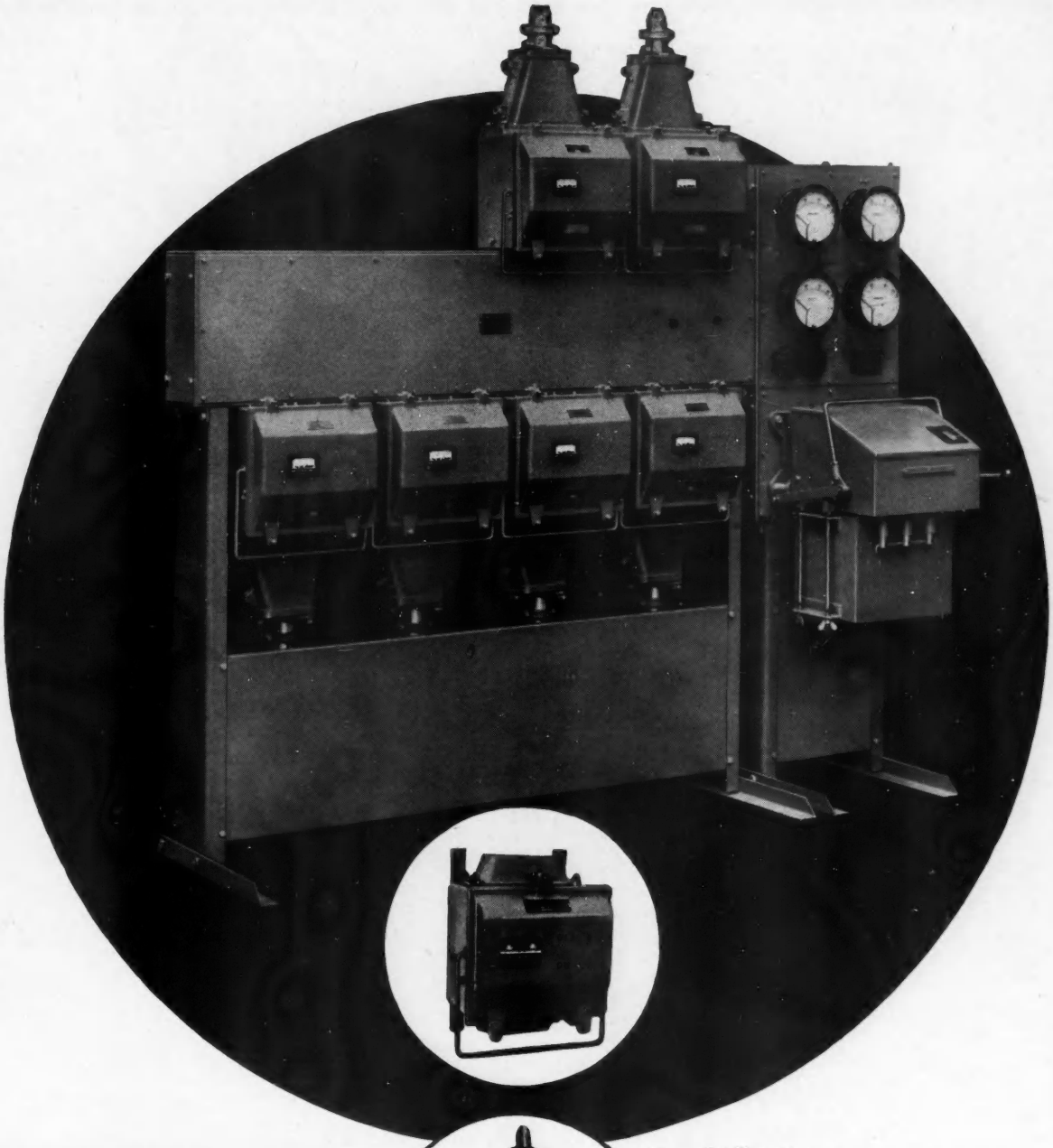

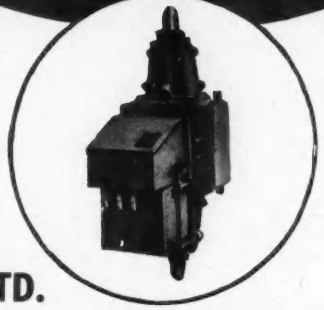

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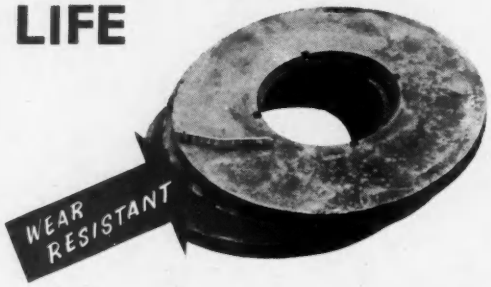

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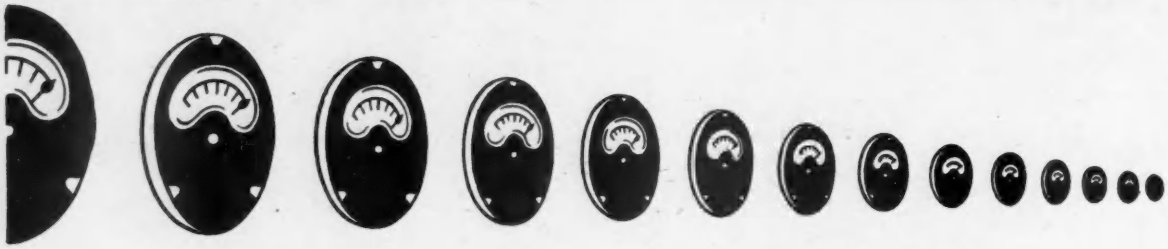

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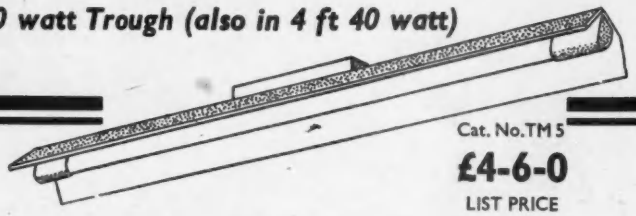

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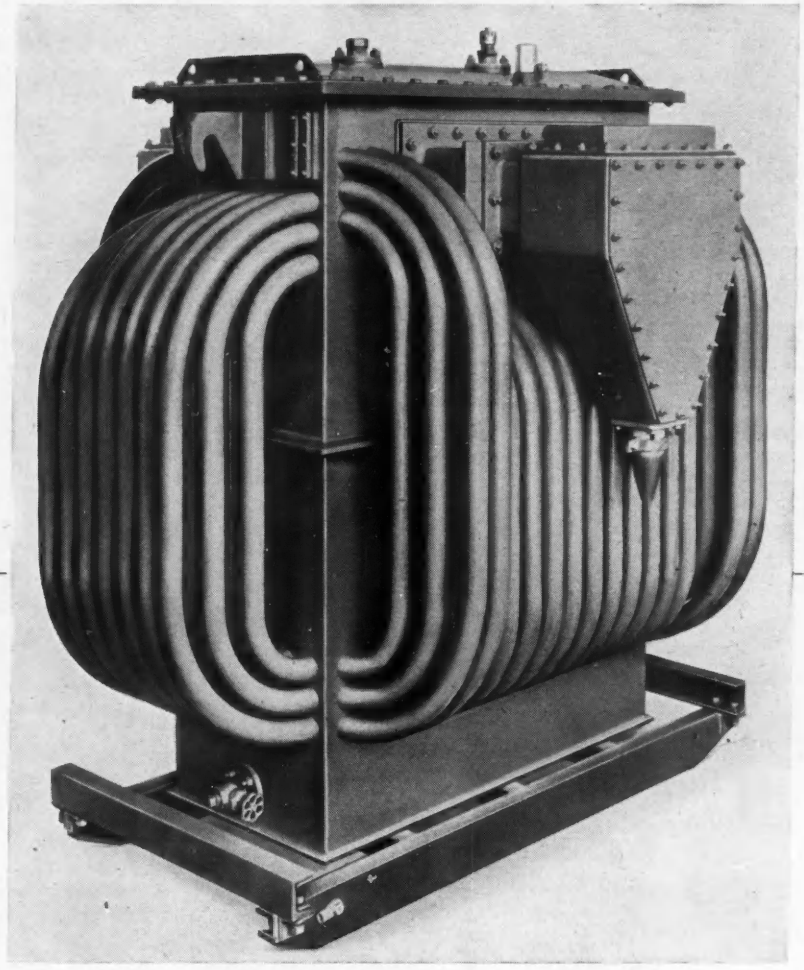

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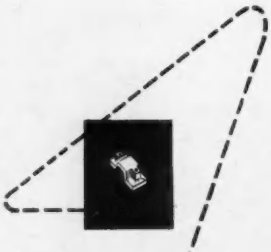

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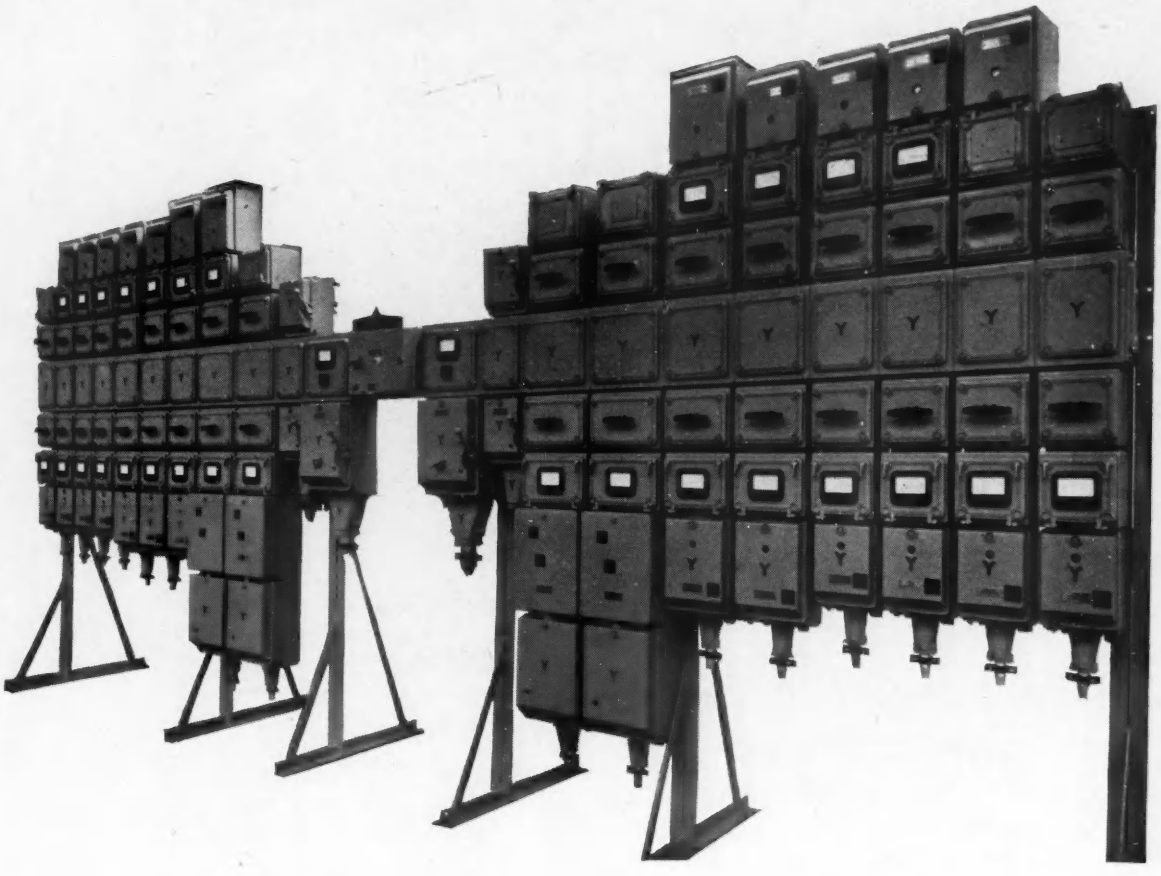

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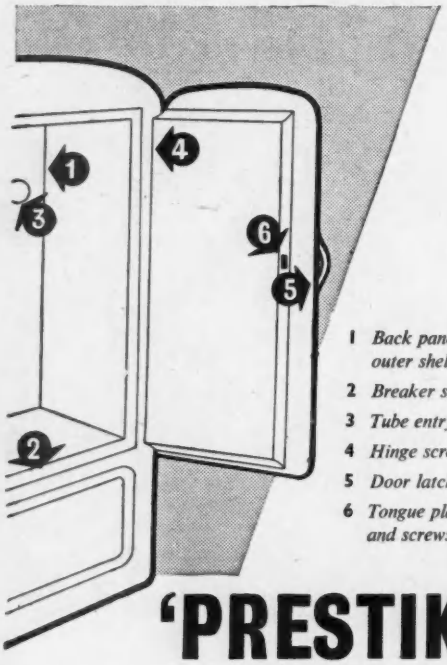

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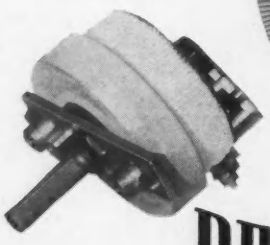

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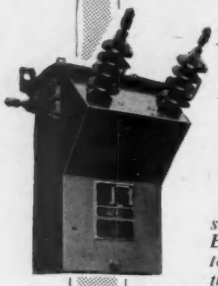

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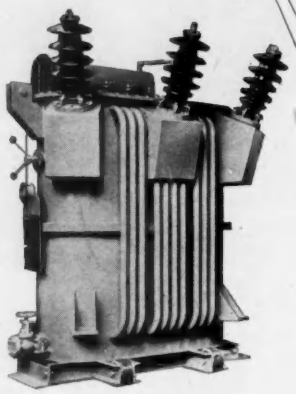

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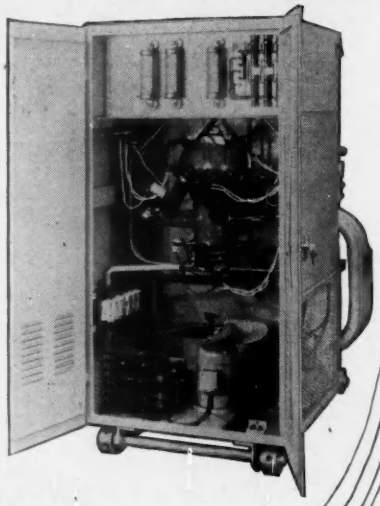

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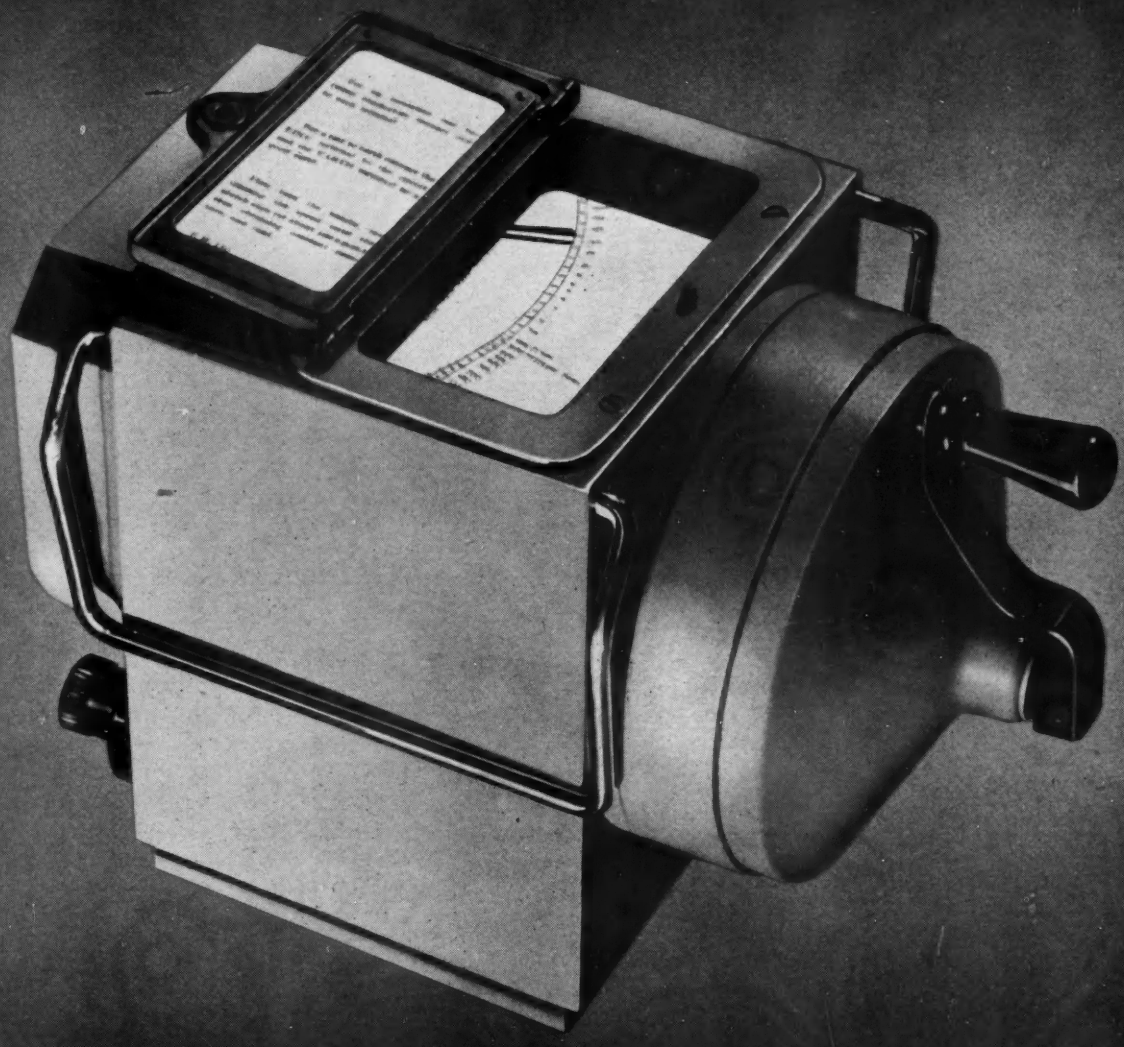

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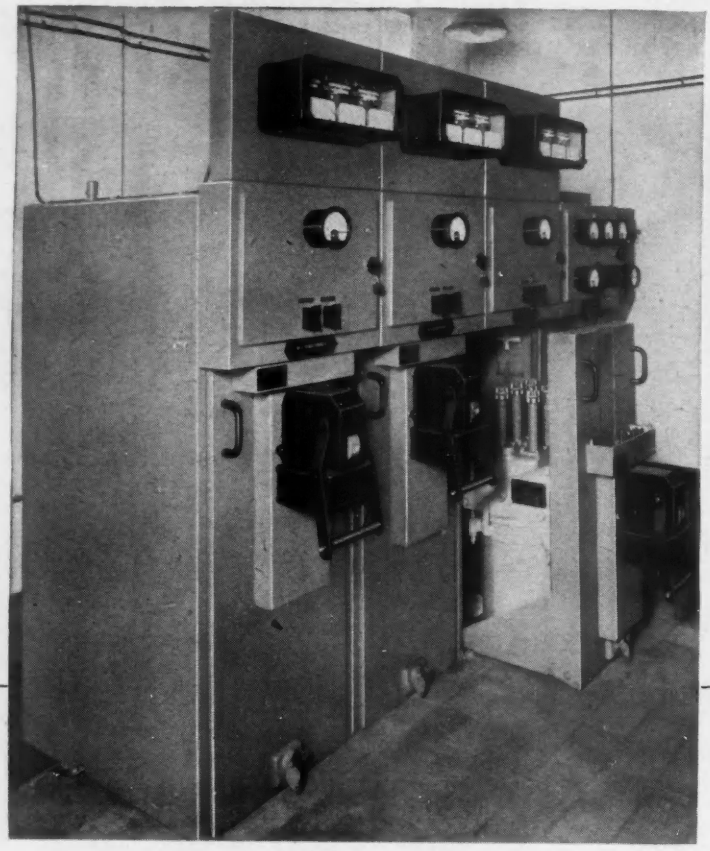

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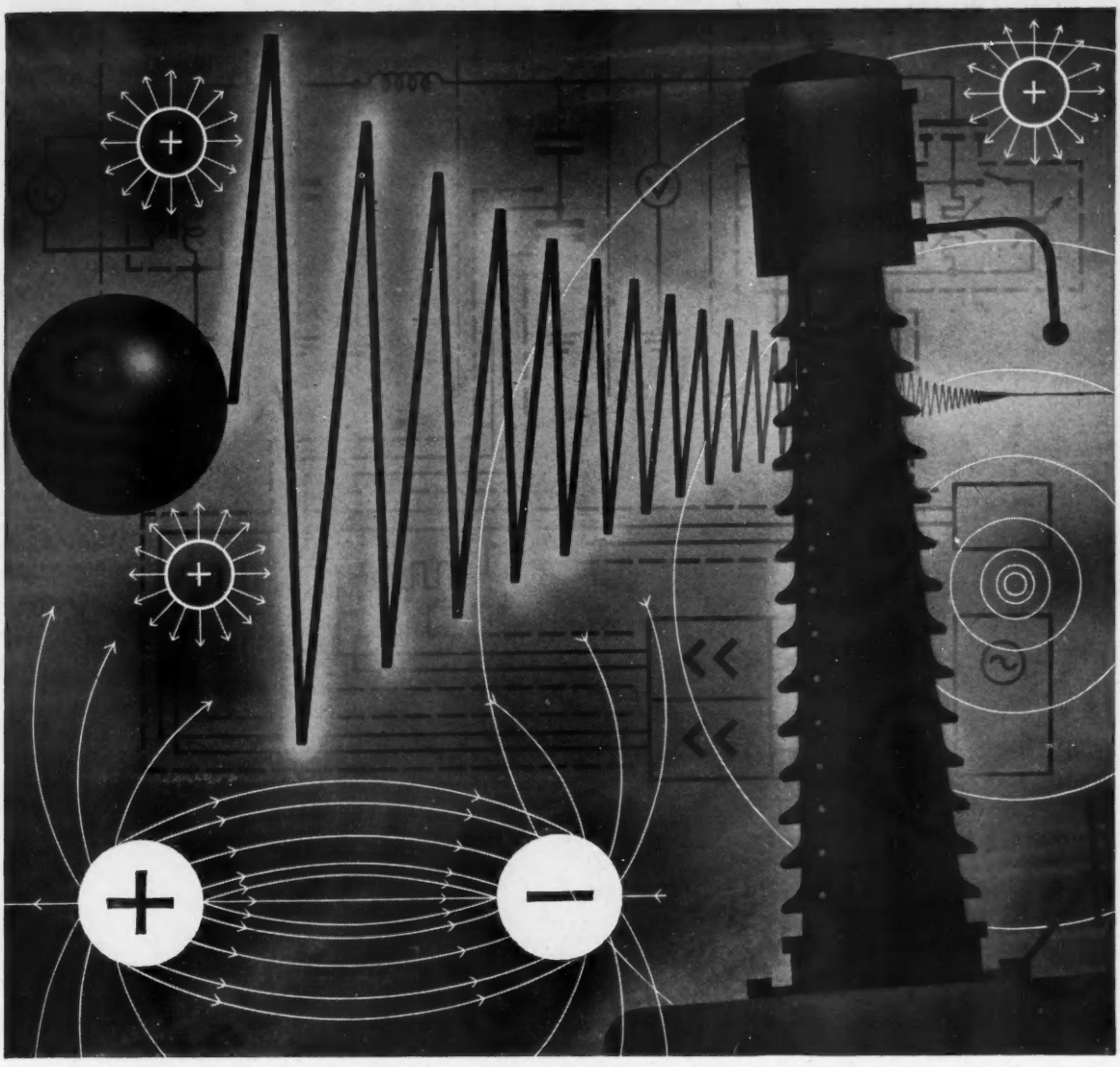

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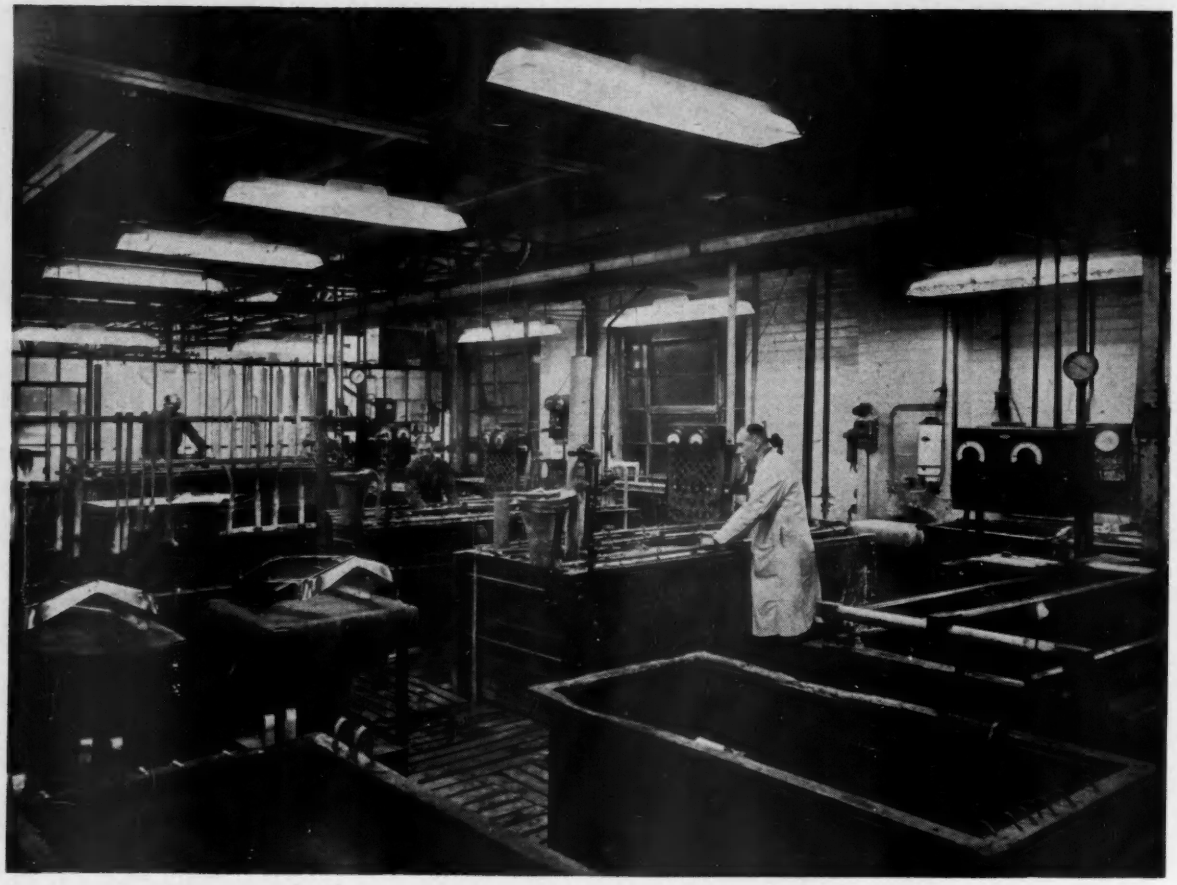

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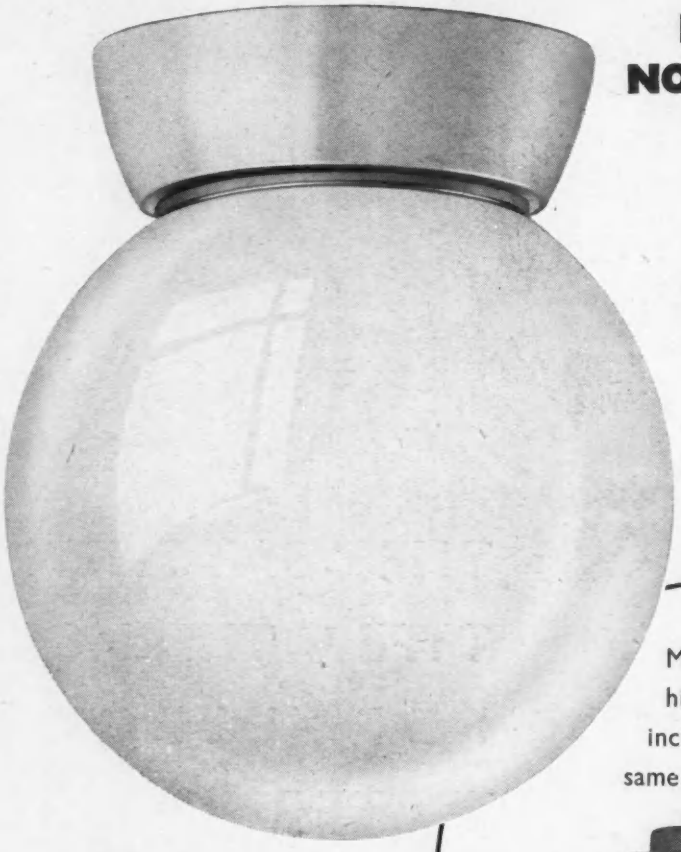

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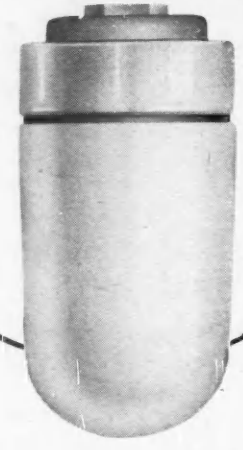

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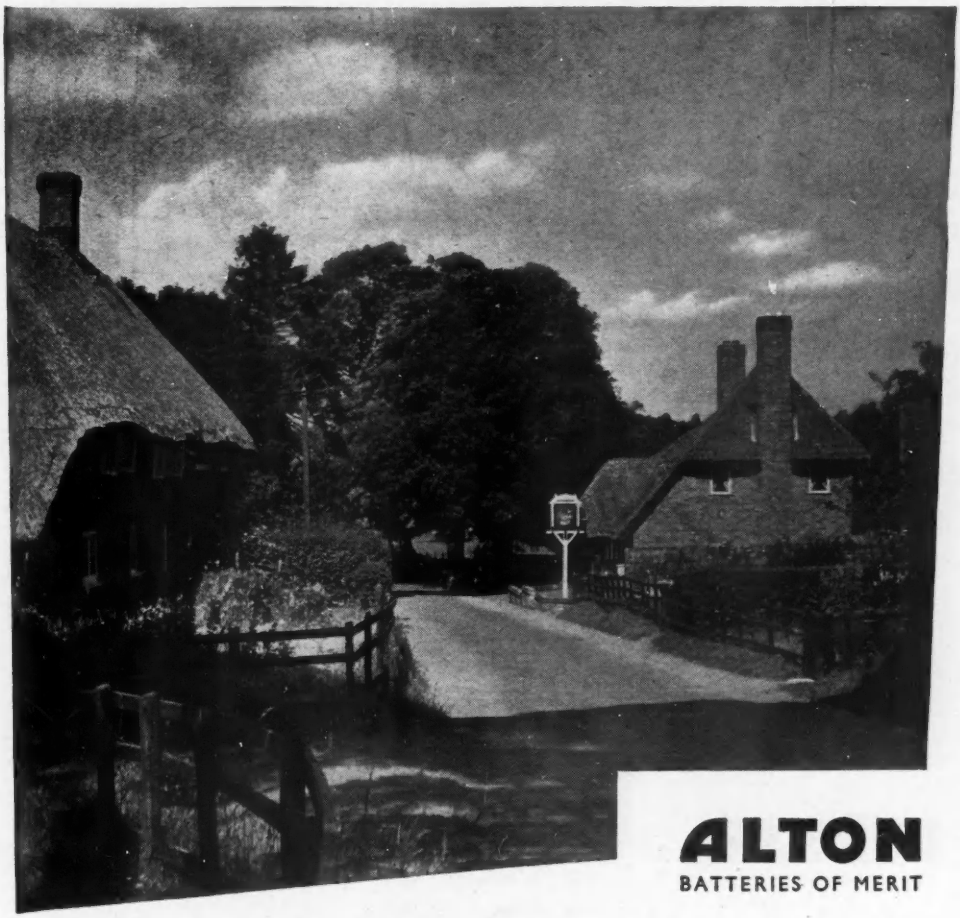

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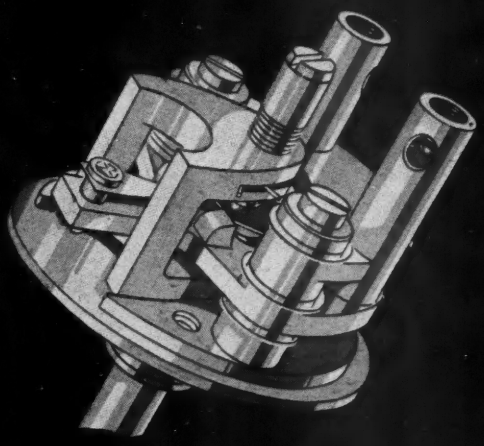

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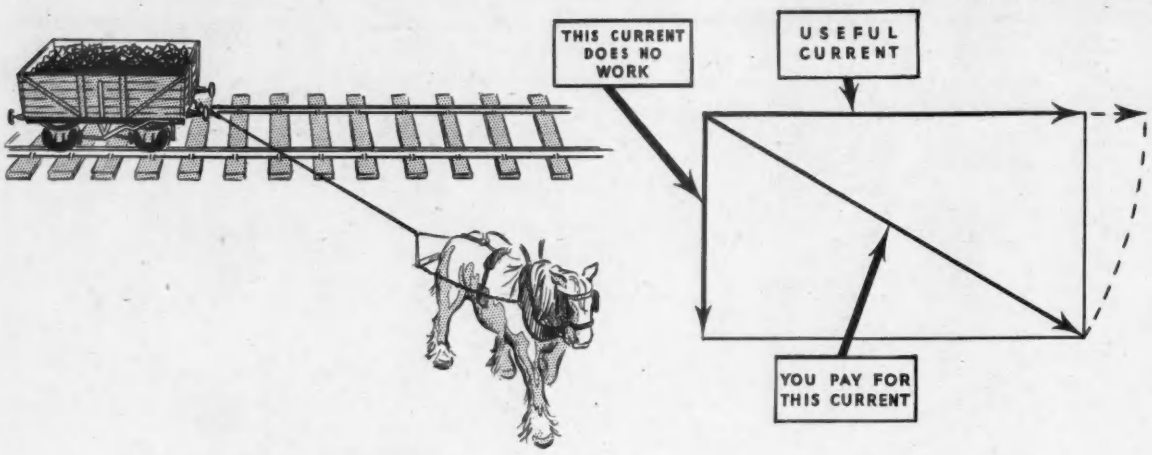

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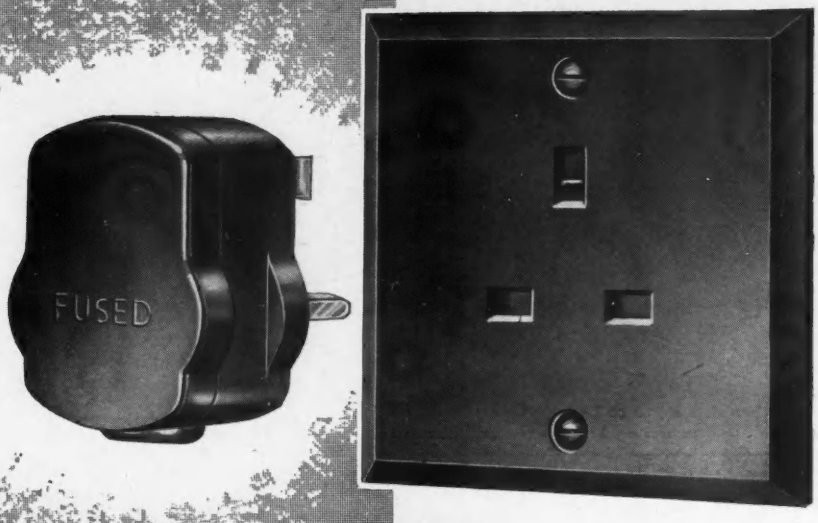

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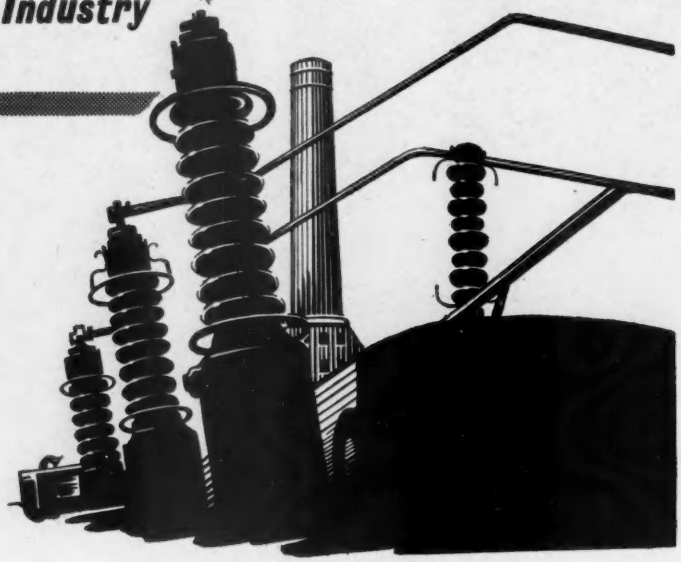

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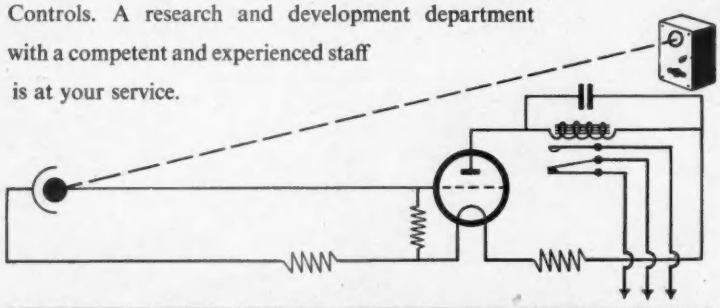

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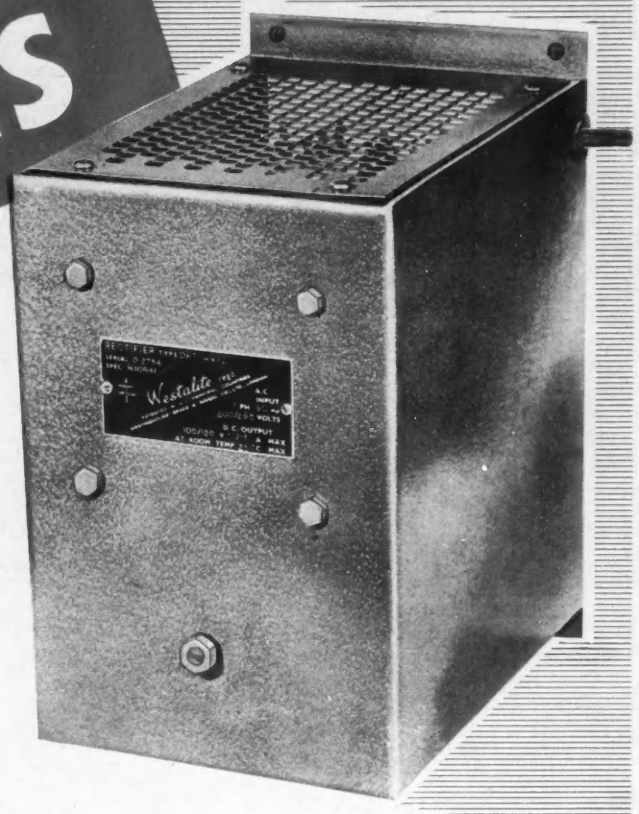

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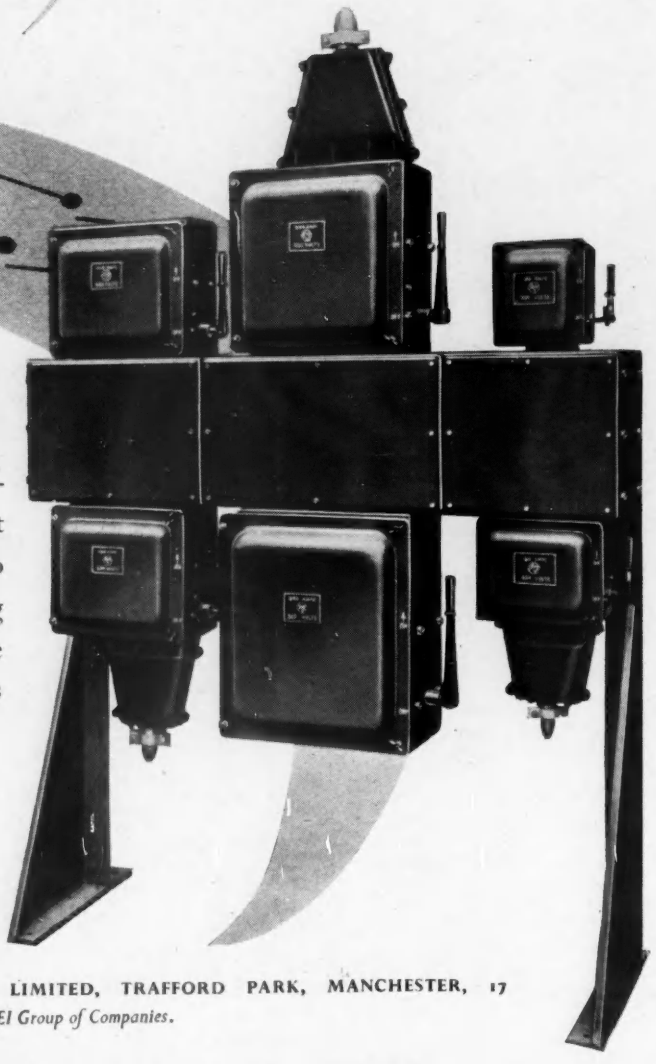

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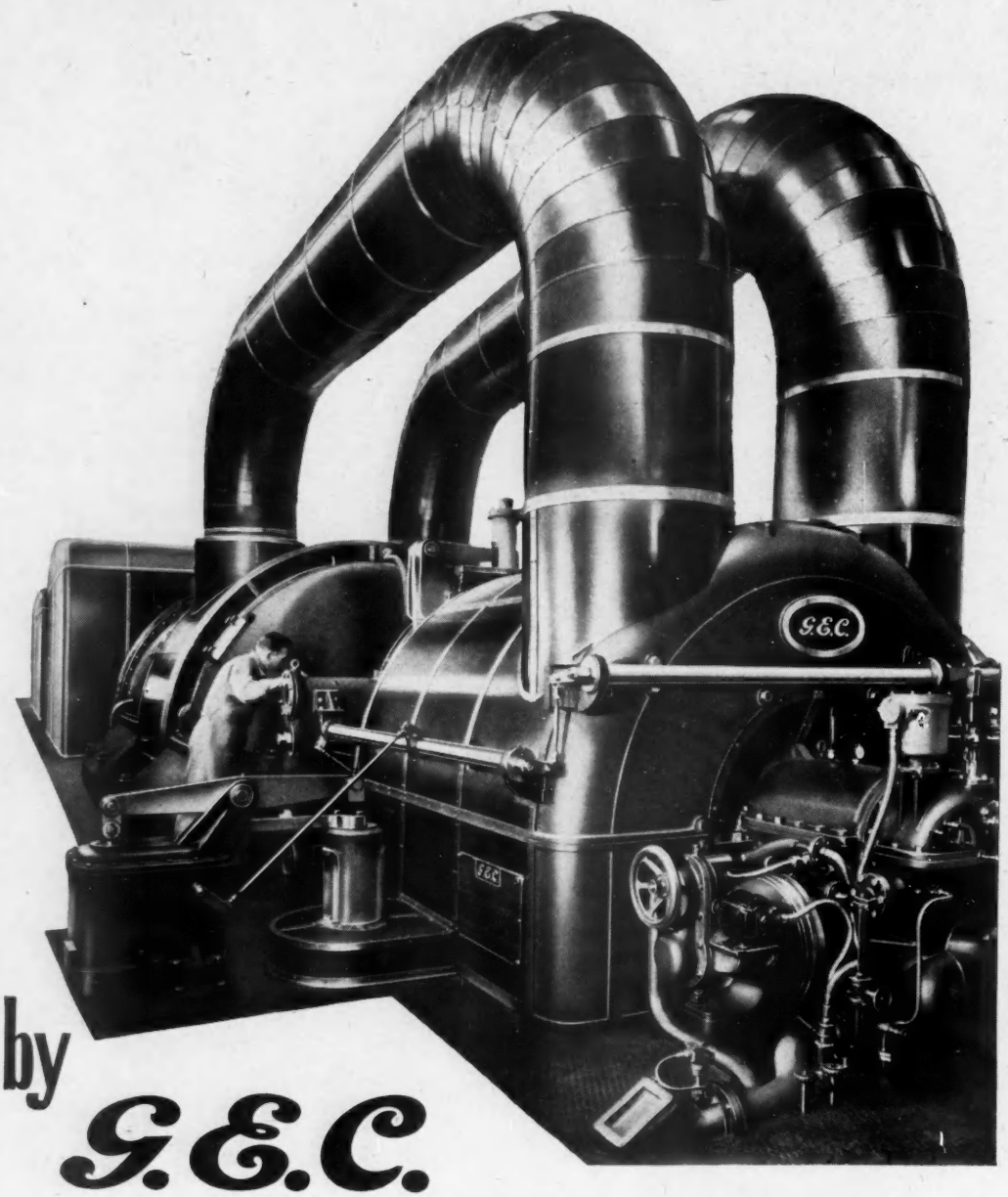

by G.E.C.

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ELECTRICAL TIMES

ESTABLISHED 1891

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SEGREGATION

Diverse and conflicting views are held within the supply industry of the desirability or otherwise of the forcible separation of generation and distribution effected by the 1947 Act. But whatever may be the preferred arrangement, it is clear that we shall have to live with the present set-up for many years to come; at least as far as England is concerned. In discussing the organisational factors associated with this segregation, so often there is left out of account its effect on the personnel of the industry. No longer is there a local team concerned with the various aspects of giving a supply to the public; instead there are two divorced organisations, linked only by mutual trading interests and a gradually dying tradition of the past. While this separation may work smoothly in some instances, experience shows that it is very dependent on the personal equation at the top. In some areas, efforts have been made to bring about a unity of staff at all levels by joint social events or by a house journal common to both board and division, but even such links based on identity of geographical area, may slacken in the future with any possible rearrangement of divisional boundaries. Yet to judge from one recent top level appointment, interchange between division and board remains possible; but any successful applicant would undoubtedly be one who has had experience in both distribution and generation prior to vesting day, for such experience is hardly possible today. What appears to be lacking at present is the building up of a middle level cadre of men with a broad background from which such appointments could be made in the future. Is the unity of purpose within the whole industry and the provision of wider experience for senior engineers in both branches, worth the not inconsiderable sacrifice in effort, time and experience that would be demanded?

DEBATE ON CAPITAL

Despite all efforts to step up productivity per man in this country the increase that has been obtained has been depressingly slight in recent months. Many reasons have been given for this in the reports which almost every week, it seems, seek to analyse the cause of our contemporary economic troubles; most of the explanations come down to the statement that British industry is failing to put in enough new machinery. Beyond this point, the various arguments separate, but the needs of our industrial survival demand that something shall eventually be done to set the position aright. When that

time comes, there will inevitably be an increase in the demand for electricity, a consideration that is of immediate importance to the supply industry since the time for commissioning industrial plant is less than that for electrical generating plant. This point lies at the root of an argument that has continued for some years now: how much generating plant is to be installed in six or seven years' time?—the decision must be taken now. Usually this debate is carried on more or less in private between those who control the country's electricity supply, and the Government departments which have the final say where large-scale investment is concerned. Consistently there has been a suggestion of restriction on the permitted plant programme, the true urgency of the electrical requirements not being recognised. This year is likely to be different in that the discussion will be brought more firmly to the notice of the general public. The B.E.A.'s statutory borrowing powers are nearly used up, and legislation to extend them will have to be introduced before long. When the necessary Bill is before Parliament, certain politicians will undoubtedly give it antagonistic attention. The probable publicity that will ensue should give the industry an exceptional opportunity for securing public sympathy for its claim to an adequate stake of the nation's investment resources. The task will not be an easy one; but the opportunity should not be missed, as others like it have, for want of an able spokesman.

AWAY FROM SUPPLY

A study of the provisional programme for this year's British Electrical Power Convention confirms a first impression that at last the sections of the industry outside electricity supply will enjoy the lion's share of interest and attention. Since the Convention aims at providing a meeting place for all interests of the British electrical industry, this is a very proper arrangement, although in the nature of things it cannot be expected to occur frequently. For all its wider functions, the B.E.P.C. has from its beginning been limited to subjects concerning the electricity supply industry, to quote Lord Citrine at the first Torquay Convention, and it is unlikely that any noticeable change will be made. Indeed, there is a particular danger about this year's programme of papers that arises from the very attention they give to other matters. They may cause some falling off in that sense of urgency which has been so welcome a feature of the last two conventions. This is not to say that the interdependence of home and export trades is other than of first importance, nor that we may not learn something of direct application from an account of installation practices overseas, but neither of these matters affect a large number of Convention delegates daily, as do the techniques of selling electrical methods to farmers, or of producing convincing arguments in favour of comfort heating. It is subjects such as these that have given a well-defined sense of purpose to the last two Conventions. If this year's speakers can overcome this fundamental obstacle of dealing with subjects that are more remote, then we should experience a third Convention of outstanding success. At least we seem to be promised one that will teach us something of the important extent of a leading export industry.

Next week's "Electrical Times" will include the first number of Industrial Maintenance, a special section appearing each month

BOOSTING THE FREQUENCY

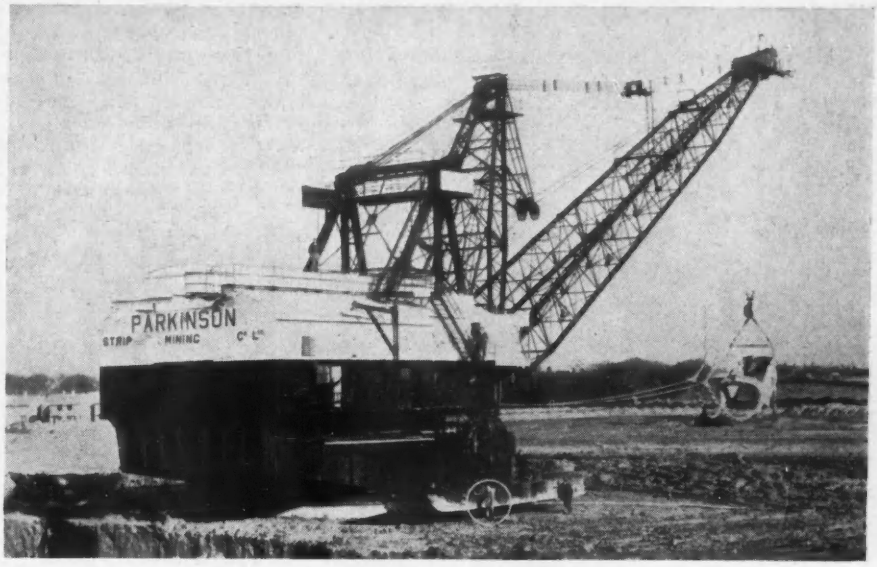
Although the rotating frequency-booster has for many years been used to provide higher than standard frequency supplies for special machine tools, its application to the provision of 1,500 kW of power is an event electrically of some importance. While the circumstances in which this requirement arose are somewhat unusual, as can be seen from our article on the installation at Ewart Hill opencast site, the fact that a machine of this size can be built to operate with high efficiency at a considerably lower cost than the more conventional set consisting of two synchronous machines, opens up considerable potentialities for this type of plant. The requirement for such frequency-boosters is admittedly limited in extent, although the tendency for 60 c/s a.c. to be used in Naval ships may provide a demand in dockyards where it is often desirable to use shore supplies to power auxiliaries during periods of overhaul or refit. And it must be remembered that many vessels using British facilities are of foreign origin and may be fitted with 60 c/s equipment as standard. In these circumstances the virtues of the booster, which include comparative lightness, inherent voltage regulation, simplicity of operation and control and capability of accepting heavy and sudden overloads without difficulty, make it an attractive proposition.

COUNTRY DRYING

Wind and sun are elusive quantities in this country; only the rain at harvest time seems always with us. No wonder, therefore, that farmers are turning more and more to the artificial drying of farm crops, which not only removes climatic uncertainty, but also offers the additional attraction of a reduction in losses of food values. Communal drying centres are now springing up in farming areas, most noticeably in the north, and, together with installations on individual farms, they are providing a load which area boards are finding attractive. At the recent E.D.A. vacation school on rural electrification, two papers devoted to different aspects of crop drying showed that all-out enthusiasm for electrical methods which is always good to see. The emphasis was placed once again on the quality of the product offered by electrical methods of drying, and on what this was likely to mean in terms of financial return, which is, after all, what mainly interests the farmer. That is only one side of the associated selling problem however: the other, as always, is tariffs. It is a relevant reflection here that the new bulk supply tariff announced last week, with its lower unit cost, should prove of some help to a load that has always been regarded as effectively off-peak. There seems little doubt now that drying techniques can play a valuable part in the wide fronted agricultural drive being made by the supply industry.

Meteor

This illustration shows the Parkinson, Bucyrus-Erie 1150 B, walking dragline at the Ewart Hill open-cast coal site at Bedlington. Some idea of the size of the machine may be seen from the man (encircled)



Power for a Walking Dragline

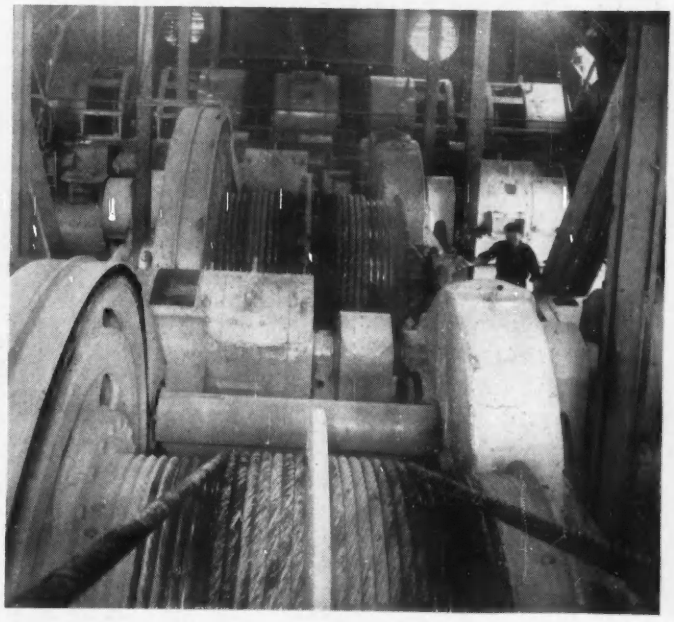
AN UNUSUAL FREQUENCY-CHANGER SPEEDS UP THE OPERATION OF THIS MAMMOTH EXCAVATOR

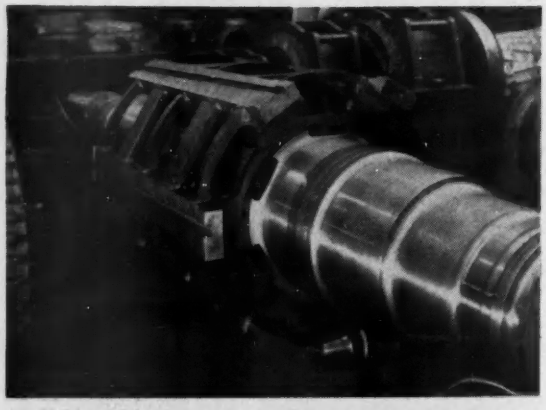
DOMINATING the landscape of the Ewart Hill open-cast coal site, near Bedlington in Northumberland, is one of the largest walking dragline excavators in Great Britain. This excavator was manufactured by the Bucyrus-Erie Company of America and is their type 1150 B. It is a completely electrically driven machine weighing nearly 1,100 tons and is stripping some 100 ft of overburden, consisting mainly of shales of hard rock which immediately overlie the coal seams. In just over a minute the machine digs out some 25 cu yds of overburden and deposits it on top of the man-made hills of spoil, while in a year it can move five to six million cubic yards.

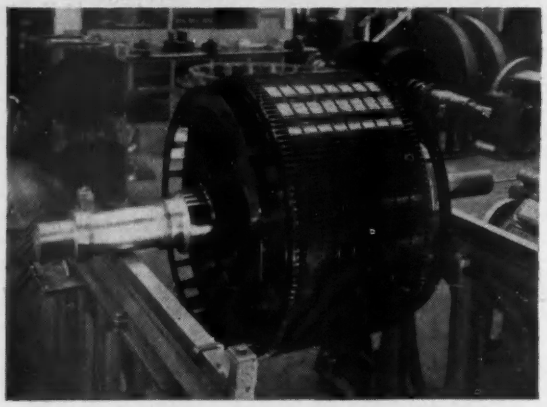
Such working rates require considerable quantities of power, and the short-time working cycle involves extraordinarily high peak loads. Further, with a machine having a capital cost running into several hundreds of thousands of pounds, it is essential to keep it operating at the maximum possible output if it is to be economically justified. When, in addition, the machine, being of American origin and design, operates on 3-phase 60 c/s power, the provision of suitable intermediary plant to supply 1,500 kW peaking to about 4,000 kW—if it is to be powered from the 50 c/s supply standard in this country—becomes a problem of some magnitude.

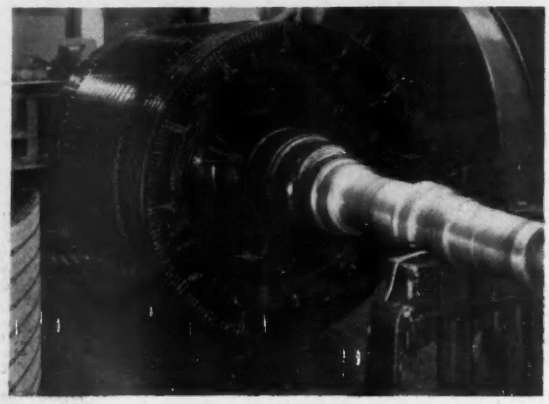
In this article is described the method adopted by the then owners of the machine, the Parkinson Strip Mining Co., Ltd., who are a subsidiary of Sir Lindsay Parkinson and Co., Ltd., the large civil engineering contractors, by using an induction-type frequency-booster which it is believed is by far the largest ever built in Britain.

This is a view looking toward the rear of the engine room of the dragline. The Ward Leonard sets are located behind the drums. A good idea of the rope size can be gained by comparison with the member of the engine room staff seen on the right









At the top of the page can be seen a photograph of the frequency-booster spider, and below it is a view of the driving motor rotor. The last photograph shows the rotor of the frequency-booster. All these pictures were taken at Bruce Peeble's Works

This site is being worked by the former Company under contract with the Opencast Executive of the National Coal Board.

Power Requirements

In order to appreciate the reason for the present, and probably unique, installation it is necessary to detail some of the more important points of the dragline itself and to go into the history of the project. As can be seen from the photograph of the machine, the bucket is operated by two sets of ropes; the twin hoist ropes being 6·3 and the drag ropes 7·86 in. circumference. The whole machine is mounted on a circular base of 44 ft diameter and is capable of rotation around this base, giving a dumping radius of 182 ft. When slueing the jib top—and, of course, the bucket with or without spoil—moves with speeds up to 30 m.p.h.

Power to carry out these movements—including the walking movement—is provided by d.c. motors. For hoisting there are two motors of 425 h.p. continuous rating; for dragging two more similar motors are used, while for slueing three 125 h.p. motors are required. D.C. power for these motors is, in turn, derived from two Ward-Leonard type sets installed in the engine room of the dragline. One of these is driven by a 1,250 h.p. synchronous motor and has four 350 kW generators which provide supply for the dragging and hoisting motors, to which they are directly connected, while the other set is powered by a squirrel-cage induction motor of 500 h.p., connected to three 100 kW slueing generators, and to exciters for the a.c. and d.c. machines. Control of the whole installation is by "Rototrol." The 1,250 h.p. synchronous motor is an auto-transformer start machine and the 500 h.p. unit is direct-on-line start. In addition to the main sets the machine contains some 42 h.p. of air compressors, 40 h.p. of motors for driving the winch and overhead travelling crane, and three 10 h.p. motors driving the Rototrols: a welding set is also provided. Input to the machine as a whole is by trailing cables and is brought in at 4·16 kV.

The Original Installation

We understand that when the excavator was first introduced into this country from America, it was the largest to be set to work outside that country. Electrical power was supplied from a power station consisting of five 600 kW 4·2 kV 60-cycle diesel-engine driven alternator sets running at 720 r.p.m. Three of these sets were on load at a time, one was retained for standby, and the remaining one was under overhaul. There was included in the circuit to the excavator a relay operated regeneration absorber unit, which was arranged to cut in the first bank of resistors at low forward power, i.e. power to the excavator, and then to increase the resistors in circuit according to the regeneration load and to its duration.

Although the response of the diesel engine governors was rapid and in spite of the regeneration absorber, the plant was unable to meet the rapid load changes without an excessive swing of frequency. On peak loads the frequency fell to 55 c/s and on regeneration rose to 65 c/s. It will be fully appreciated that the duty on the sets was severe in the extreme.

After the first year's operation it became evident to the owners of the equipment that considerable economies were likely to result in providing the excavator with a supply of energy from the public supply system. Accordingly the late Mr T. Birchall, Chief Mechanical and Electrical Engineer of Sir Lindsay Parkinson and Co., Ltd., and associated Companies, approached the Mining Section of the North-Eastern Electricity Board with a view to taking a supply direct from the Board's network.

The Company had decided at the outset that the operation of the excavator direct on the 50-cycle system could not be tolerated due to its reduced excavating capacity, which meant that either (*a*) the equipment be re-motored with suitable 50-cycle motors or (*b*) arrangements be made to provide the excavator with a 60-cycle supply by means of a frequency-changing equipment of suitable type.

Method (*a*) was not considered possible since the speed of the main motors was 1,200 r.p.m. for which speed no 50-cycle motor could be readily produced. Moreover, the excavator could not be spared for a prolonged shut-down such as would be required for the extensive modifications,

necessary for altering in any way the existing Ward-Leonard sets to work directly from 50 c/s supply.

The Solution

It remained, therefore, for frequency-changing equipment to be used. The Board's Mining Section suggested that probably the best solution would be to provide the power through an induction type frequency-booster in preference to the use of a synchronous motor-generator set or even an induction motor-driven motor-generator set. They also mentioned that some difficulty would be experienced in obtaining a set of the size which appeared to be required, since it was by no means a well-established product. Further, they had no knowledge of any set larger than the 400 kW set installed, on their recommendation, at a pumping station in the area supplied by the former North-Eastern Supply Co., Ltd. This 400 kW set operated at 440 V, but due to the large power to be handled at Ewart Hill, it seemed necessary to consider a set operating with an input voltage of around 3 kV. Moreover, this voltage would have to be handled on slip-rings, which is unusual.

They based their recommendation of the frequency-booster set on the following advantages (1) lower capital cost, (2) higher efficiency, and (3) the total absence of automatic voltage regulators and similar equipment.

Since no typical load diagrams were available, it was agreed with Mr Birchall that as a first step the Board's meter section should take records of the loading of the excavator to assist in determining the rating of the booster set required. These records showed that it was desirable to obtain frequency-changing equipment of 1,500 kW at 0·9 power factor, continuous rating. The momentary peak loads to be expected from the excavator when on steady frequency were not available and it was therefore decided to provide an adequate margin of safety by calling for a set capable of delivering 4,000 kW for short periods.

It may be mentioned that apart from the 400 kW frequency-booster referred to above which is used for driving a pumping installation, frequency-boosters have, so far as is known, only been used in this country to supply small high-speed tools such as woodworking machinery, drills and the like.

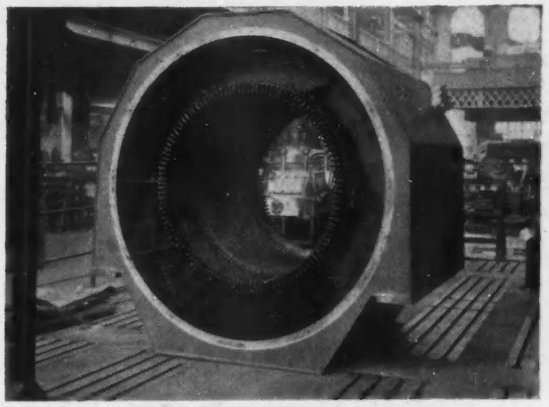
Bruce Peebles and Co., Ltd., offered to design and manufacture the frequency-booster. On the score of capital cost alone their offer was considerably less than the alternatives considered which were (*a*) the more usual synchronous frequency-changer or (*b*) the provision of induction motors to drive two of the existing 60-cycle alternators.

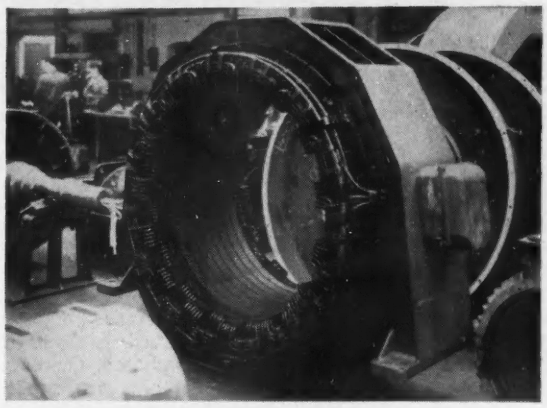
The frequency-booster was by far the best plant offered.

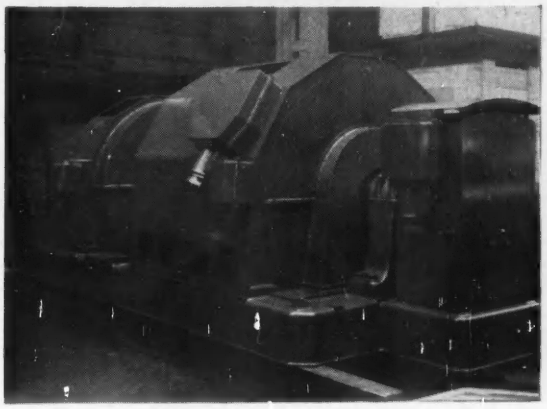
Power Transformation

As far as the Board was concerned the supply of power for the frequency-booster presented little difficulty, as a large 66/20 kV substation containing two 24 MVA transformers already existed near the site, and a 20 kV line ran from this substation passing close to the building in which the frequency-booster was to be housed. It was only necessary in consequence to take a "T-off" from this line and install the necessary switchgear to provide a supply of ample proportions to cope with the fluctuating load. The "T" line is brought into the switch-house through a length of cable, which is the Board's standard method of terminating overhead lines as a part protection against surges and other transient phenomena. A separate transformer of 2 MVA steps down the 20 kV supply to 3·3 kV for booster. This transformer is housed in a special building designed for the purpose on the site at Ewart Hill.

The principle of operation of a frequency booster, although simple, is not widely known, probably due to the comparatively small use of these machines. Fundamentally the set consists of the frequency-changer itself, which closely resembles a slip-ring inductor motor, and a direct-coupled squirrel cage driving motor. The frequency-changer is a four-pole machine with a wound rotor connected to the 50 c/s mains supply via slip-rings. If the machine were held stationary, the 1,500 r.p.m. rotating field produced by the rotor would induce a corresponding 50 c/s output in the stator. The speed of this rotating field in space can, however, be varied by rotating the rotor. Thus, by driving the rotor in the direction of rotation of the field at 300 r.p.m., the speed of the field becomes 1,800 r.p.m.







Further pictures of the construction of the machine are shown above. These were also taken in the works and (from top to bottom) include the frequency-booster stator, the motor stator and finally the complete set on the test bed

with respect to the stator, and a 60 c/s output is produced. In this case a 20-pole squirrel-cage motor provides the driving power and gives the shaft a speed of 300 r.p.m. on no load and 295 r.p.m. on full load. A simple calculation shows that the e.m.f. generated in the stator winding will have a frequency of 60 c/s on no load and 59·8 c/s on full load—assuming, of course, that the input frequency to the set remains constant at 50 c/s.

The power of the driving motor in a set of this nature may be taken as approximately equal (neglecting losses) to the kW output of the set multiplied by the amount of frequency-boost. Thus the b.h.p. of the driving motor can be calculated from the following formula where f_2 = output frequency and f_1 = input frequency.

$$\text{b.h.p.} = (\text{kW output}/{\cdot}746) \times (f_2 - f_1)/f_2$$
$$= (1{,}500/{\cdot}746) \times (60 - 50)/60$$
$$= 336 \text{ b.h.p.}$$

Motor Design

In the actual set the driving motor is a 345 h.p. machine with a rated input of 3·3 kV, 64 amps and is arranged for direct-on-line starting, the starting current being in the neighbourhood of 470 amps. This high starting current is necessary to provide the motor with an unusually high maximum torque value so that the whole unit can supply peak outputs in the region of 4,000 kW for 15 seconds. Judged against the total full load input of 368 amps at 3·3 kV for the motor and the frequency-changer the starting current of 470 amps, which only occurs when the frequency-changer itself is inoperative, can scarcely be regarded as excessive.

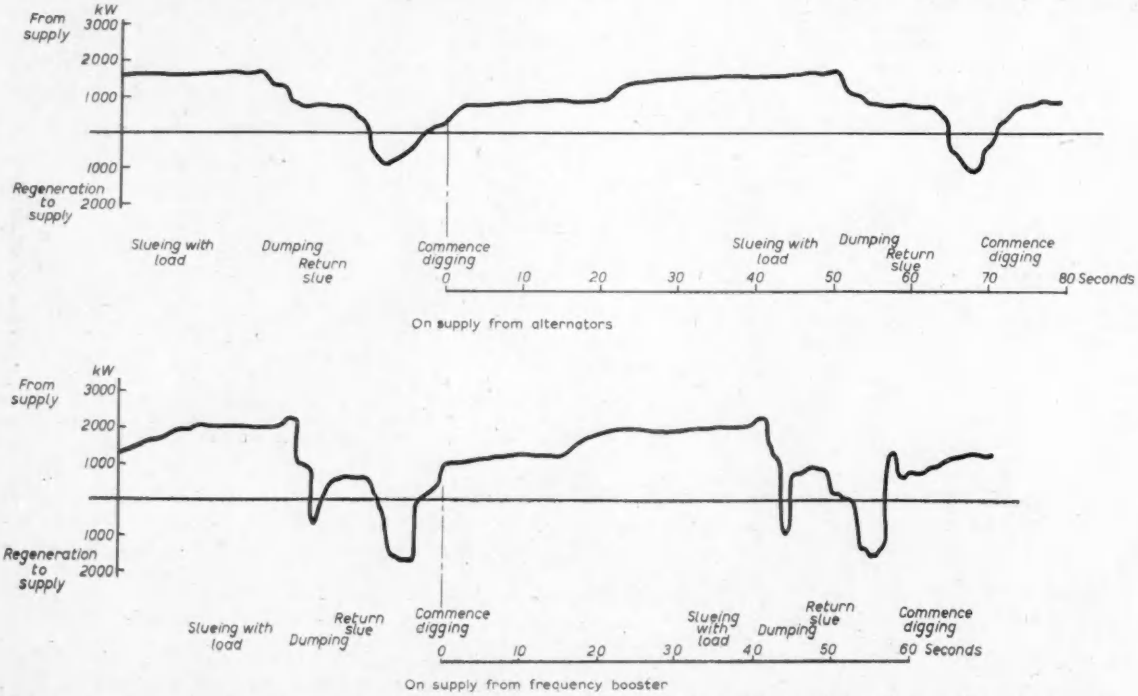
The 3·3 kV motor stator winding is of the two-range concentric hairpin type laid in semi-enclosed slots, and the end winding is braced to rings supported from the stator endplates. Extra inter-turn insulation has been applied to the phase end coils to withstand voltage surges.

A single squirrel-cage rotor winding is employed made up of fatigue-resistant copper-alloy bars rigidly held in the slots by the Bruce Peebles "Keyed Bar System." This method of attachment is claimed to hold the bars far more tightly than is possible with the more usual methods of construction, thus giving freedom from trouble caused by loose or fractured rotor bars. The bars themselves are brazed to the copper short-circuiting rings through the medium of a special brazing alloy which has been developed for this purpose.

Frequency-booster

In the frequency-booster itself, the stator winding is fairly straightforward, being of the bar lap type laid in semi-closed slots. It is star-connected with the neutral brought out for earthing purposes, and again special physical reinforcement of the end windings has been carried out by bracing them to support rings carried from the stator endplate. The rotor, however, presented several difficulties. It is most unusual to find a rotor which is continuously alive at a voltage as high as 3·3 kV and this, together with the low running speed caused several departures from normal design. Fundamentally the winding is also of the bar lap-wound type in semi-closed slots. The end winding is, however, banded with non-magnetic banding wire in order to keep the winding reactance low and avoid heating due to the 50 c/s frequency in the winding. A further difficulty is the avoidance of eddy current losses in the shaft between the slip-rings and the winding. This is overcome by connecting the slip-rings to the winding by nine single-core cables divided into three individual 3-phase groups each containing three single-phase cables. Each group is brought through the shaft in one of three holes, drilled through the metal at 120° centres. This again reduces the reactance as well as preventing heating.

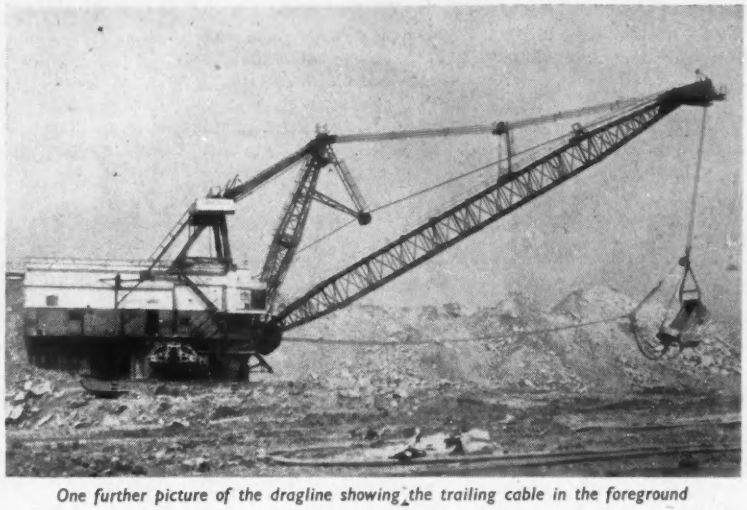
The slip-rings are of Admiralty gunmetal shrunk on to a Micanite insulated cast-iron bush. Owing to the high working voltage of 3·3 kV, long creepage-path barriers are provided between the rings and earth. Six copper-carbon brushes per ring are provided in plunger type holders.



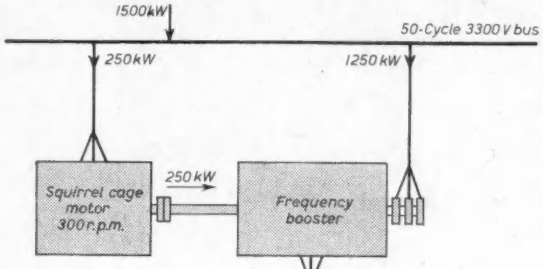
These two curves were recorded on the same day while the dragline was operating under virtually identical physical conditions. The upper one shows the power supply time curve using the 60 c/s diesel alternators, and the lower one a similar curve with the booster in operation. Points of interest include the greater capability of the booster in supplying sudden loadings and the shorter overall time for the digging cycle

Mechanical Design

Opencast mining operations involve occasional change of site where an area has been turned over, treated and relaid. Heavy expense and loss of time occur in moving plant and equipment from one site to another, a process which may occupy several weeks. These operations present an ideal case for the frequency-booster in view of its reduced weight and easier transport when compared with the more conventional type of frequency-changer. The set is of fabricated steel construction which gives increased strength, and it can be transported in one piece. Further, as the driving motor is only of 345 h.p. for 1,500 kW output the set does not need the extensive foundations that would be necessary for a synchronous type frequency-changer where the full overall torque would have to be considered.



One further picture of the dragline showing the trailing cable in the foreground



Schematic circuit diagram of motor and frequency-booster

Again, however, problems peculiar to the set had to be overcome. The small air gap in the frequency-changer required a shaft of exceptional stiffness and consequent large diameter, and the rotor needed deep core iron to carry the heavy four-pole 50 c/s field. These contradictory requirements left no space for a rotor spider of conventional construction which would, at the same time, have space for adequate passage of cooling air.

This problem was overcome by providing the machine with independent forced draught coolers, and by using a fabricated steel spider welded on to the shaft. The complete spider assembly and shaft were heat treated to relieve any welding stresses. Apart from the special rotor design, however, the provision of an external forced cooling system was also called for by the length of core, low rotational speed and the length of the machine. Some of the air, which is provided by an independent motor driven fan taking in its supply through filters, is bled-off from the main system and passes through the bedplate to the 3·3 kV slip-rings, after which it is discharged to atmosphere. In view of the heavy load fluctuations with rapid variations up to 4,000 kW, high mechanical strength and shock-resisting windings were major factors in design, and an all-steel construction with efficiently braced windings was adopted. The set is provided with ring lubricated journal bearings and weighs about 25 tons, a remarkably light weight when the design duty of the set is considered.

The ability of the set to deal with heavy load swings was well shown when we watched it operating some time ago. It had then been running for over a year and had proved eminently fitted for its task. In addition it has been found in practice that operation of the dragline is speed up by a matter of 7% due to the continuous presence of ample power, available instantaneously as required.

On test at the manufacturer's works the ability of the set to deal with rapidly varying loads was proved by swinging the load repeatedly from 110% full load forward to 120% full load in the opposite direction within a time of 2 seconds. Efficiency tests, also carried out in the works with the set delivering power at 0·9 p.f. gave full load efficiency of 93·64%; 75% load efficiency of 92·21%, and 50% load of 90·30%. Voltage regulation tests—and the machine has no external means of voltage regulation—showed that the no load output voltage was 4% higher than the full load output voltage and only 0·6% higher than the estimated figure. The output voltage waveform was examined by means of an oscilloscope and found to be practically a pure sine wave. This excellent voltage regulation was achieved by keeping the winding reactance as low as possible.

Operation

One of the greatest advantages is the simplicity of starting the set. Interlocking is provided so that the correct sequence of operations must be carried out. First the blower motor is started up. This is followed by starting the driving motor. When the set is up to speed, which takes about three seconds, the 3·3 kV, 50 c/s supply is switched on to the frequency-changer rotor, and finally the 4,160 volt 60 c/s output circuit-breaker is closed. The reverse sequence is used for shutting down. Further interlocking is provided so that in the event of the blower motor, main driving motor or the supply to the frequency-changer slip-rings being tripped, all other breakers open and the set shuts down. Should, however, the 4,160 volt output circuit-breaker trip, the set continues to run on no load until the breaker is again closed.

As a further precaution, the set is equipped with an overspeed trip mounted on the shaft at the non-driving end of the motor. This trip is of the centrifugal unbalanced type and is set to operate at 350 r.p.m. in either direction. The reason for this additional precaution becomes obvious when it is remembered that the frequency-changer is in effect a 4-pole slip-ring motor and the possibility exists under certain—but very unusual—fault conditions, of the set tending to accelerate to +1,800 r.p.m. or −1,500 r.p.m. As it is not economic to design the set to run safely at

speeds of this order, the fitting of an overspeed trip provides good additional protection against the serious damage which would be caused by overspeeding. Instantaneous earth leakage protection is also provided. The trailing cable itself is of interest as it is a 4-core, 6 kV flexible type made by Messrs Glovers Ltd. The type used is v.i.r.t.r.s. pliable armoured to Type 321 of B.S. 1116/1943.

Experience with this frequency-booster has been so satisfactory that two further identical sets are now on order, also for similar draglines of American manufacture.

Our thanks are due to the Parkinson Strip Mining Co., Ltd., Bruce Peebles and Co., Ltd., and the National Coal Board and the North-Eastern Electricity Board for the information given in this article.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Bonding and Earthing

IN your issue of 7th January, Meteor writes of "Earthing Uncertainties," referring to the dual use of the term "earthing," and I suggest that here is much confused and loose thinking on this subject. I agree with his remarks as to the true function of earthing being the prevention of excessive rise in voltage, and assume that this refers for example, to the connection with earth of the neutral point of a transformer.

His remark that the second function of earthing is "that necessary to ensure the operation of protective devices if insulation fails," is not, I suggest, a true function of earthing.

The effective *bonding* of all non-current-carrying metal is necessary to provide a path for fault currents so that any protective devices are operated, and although this bonding may, *inter alia*, be connected to earth at a point, or points, other than at the power source, the only really necessary "earth" for this purpose is at the same place as the power source, possibly the neutral earth of the transformer. It would appear that engineers should clarify their minds as to the true functions of (*a*) Earthing and (*b*) Bonding.

F. A. Geary, M.I.E.E.
MIDDLESEX.

Thermostats for Motor Protection

I READ with interest the article on "Thermostats for motor protection" which appeared in your issue of 10th December, 1953.

The author did not mention the siting of the thermostat in the motor, or the means of re-setting after operation.

Some time ago I fitted a f.h.p. motor to a lawn mower and after operating some time on a very hot day the motor ceased to function. I opened up the motor and found that a bi-metal thermostat was hidden behind the terminal block. All that was necessary was to reset the thermostat by inserting a small screwdriver in a slot in the terminal block. The additional heat from the sun had overheated the motor and operated the cut-out. The motor is now insulated from the sun's rays.

The point I wish to raise is the desirability of fitting a label to the motor to the effect that a thermostat is fitted and in addition it is important that:

(*a*) If self-reclosing, the approximate necessary time for cooling off should be stated; and

(*b*) The method to be adopted if the thermostat is hand re-setting.

K. Coombs, A.M.I.E.E., A.M.I.MECH.E.
CAPE TOWN.

Fluorescent Street Lighting

THE question of the best form of street lighting is one which crops up practically every winter. As far as the motorist is concerned all he wants is the best form of lighting which will enable him to see objects on the road as far away as possible with clarity and vision. On this point I have to disagree with Mr Wagland in your issue of the 7th January that fluorescent lighting is best. I must, however, admit that I do not know of a section of road lit by fluorescent lamps which is long enough or straight enough to give a comparative test between sodium vapour and fluorescent from a high-speed motoring viewpoint.

Taking, however, the ratepayer's attitude as exemplified by "1066" it is justifiable to assume that anything which will keep down the rates is of major importance, and under these circumstances it certainly seems that, at the moment at least, sodium wins. Admittedly the colour rendering properties of sodium vapour lamps is bad, but like many things the public seems to have become largely acclimatised to it.

To my eyes at least, the monochromaticism of sodium vapour appears to be an advantage, particularly when driving in misty or foggy weather, although I do not know of any scientific evidence which would support the view that this is in fact so.

"Another Motorist."

Power at the Bath and West Show

TO take effect at the Show at Exeter this year, the Bath and West Society have decided to install their own generating plant on the Show ground. This decision was made in the face of the heavy expenditure incurred by the Society in taking a public supply, which involved considerable charges for connection apart from the cost of energy. A number of British manufacturers are co-operating in the project, the final design of which is the responsibility of the Society's Consulting Engineer. It is planned to operate private plant at the next five shows.

The generating plant to be used this year will comprise three 500 kVA, 400/230 V, three-phase 50 c/s alternators each driven by an eight cylinder, vertical, super-charged diesel engine. Incorporated with the sets are the necessary alternator and outgoing feeder panels and heat recovery plant. Consisting of exhaust heat and engine circulating water boilers, the heat recovery system will supply hot water for all exhibitors and the show authorities. Fed from the heat exchangers to a storage tank, the hot water is to be piped in mains laid throughout the showground. It will be available for caterers, canteens, toilets and other purposes. Plastic pipes, it is hoped, will be used for this purpose, these being laid by the "mole plough" method.

For distribution a 400/230 V, three-phase, four-wire o.h. system will provide supplies throughout the ground. It will cater for all exhibitors and services requiring a supply, the charge made in each case comprising a connection charge and the cost of wiring or apparatus installed. The cost of energy is included and it is hoped charges to exhibitors will show a substantial reduction on those for previous shows. Arrangements with manufacturers supplying the plant, and its high thermal efficiency (estimated to be from 70 to 75%, taking heat recovery into account), enable these reductions to be made.

Continuity of Electricity Supply

Factors affecting the operation and protection of Large Systems

THE Parsons Memorial Lecture was this year delivered at the I.E.E. by Mr H. Leyburn, who explained that his lecture was not intended for the expert, but rather "to show one half of the engineering world what the other half does." He pointed out that the obligation to provide a cheap and abundant supply of electricity implied the necessity for the supply to be continuous. The subject fell naturally into three sections: (i) the design and operation of power systems under normal conditions of service; (ii) the causes and effects of disturbances or faults in power systems and the measures taken to avoid them; and (iii) the means for maintaining supply if faults did occur.

Interconnected Systems

An interconnected system in which loads could be connected at will to any generating plant not only reduced the amount of generating plant required but improved the reliability of the supply, provided means were available for disconnecting a faulty piece of equipment without at the same time disconnecting a healthy piece. Dealing with the various types of interconnection, he referred to the radial feeder system, usually restricted in highly industrialised countries to 11 kV, ring mains and interconnected systems from one power station, used up to 66 kV, and power-station interconnectors at 132 and 275 kV, and occasionally at 66 kV.

In many countries lightning was the biggest single cause of faults, and even in Great Britain 40% of faults on overhead lines and about 20% of all faults on the power system were due to lightning. The most important factors in lightning protection work were the current magniture and the waveshape of the discharge. Currents up to 100 kA had been recorded, the average being about 20 kA. The waveshape varied widely, but for the purpose of simulating lightning surges when testing electrical equipment a unidirectional impulse voltage having a shape of 1/50 microsec had been standardised in Great Britain.

Insulation Failure

Another cause of breakdown was insulation failure due to adverse weather conditions or to the long-term effects of normal service voltage. An example of the former was flashover of overhead line insulators due to atmospheric pollution, which had been greatly reduced by the use of anti-fog insulators. The small capacity current which flowed in the dielectric of an insulator caused heating which was dissipated through the outside of the insulator. If the rate of heat dissipation was less than that of heat production breakdown would eventually ensue.

Closely linked with the protection of a power system against lightning was the question of its insulation level and insulation co-ordination. The general level of insulation must be such that there would be no flashover or breakdown with the highest possible internally generated voltage, which was that produced by the switching off of a highly inductive or capacitative circuit, the magnitude of which depended not only on the design of the circuit-breaker but on the constants of the circuit being switched. The switching voltage should not exceed 3 to 4 times the normal voltage. Having decided upon the general level of insulation, differences between the levels of various portions of apparatus could then be established.

Since it was impossible to eliminate faults, protective systems and circuit-breakers were necessary. The total time allowed for the clearance of faults, which at the beginning of the century had been a second or more, had now been reduced to 0·2 sec or less. Where there was danger of instability the clearance time had to be still further reduced, and in Sweden, where hydroelectric power generated in the north was transmitted in bulk over 600 miles to Stockholm, it was claimed that a time of 0·08 sec had been obtained. On the British Grid, on the other hand, there was little tendency to instability.

Discrimination

Much thought and ingenuity had been devoted to the development of discriminative protective systems, which would operate when there was a fault in the equipment which such a system protected but would remain stable when fault-current flowed through that equipment to a fault elsewhere in the power system. Most systems depended on intelligence conveyed from one end of the protected apparatus to the other. To illustrate the general principles on which they were based he dealt with three feeder systems. The first was the balanced system in which the current entering the feeder was balanced, both in phase and magnitude, against the current leaving it. The second system employed phase comparison and depended on a comparison of the phase relation between the currents at the two ends of the protected feeder. As the magnitudes of the currents were not compared but only their relation in time, all that was required was the transmission of simple signals from one end of the feeder to the other. This system was particularly suited for the protection of overhead lines where pilot wires were not available.

The third system, the time-distance system, differed from the first two in that its stability was not entirely independent of what happened in adjacent feeders. Under fault conditions the voltage and current at a feeder end were compared and the impedence of the conductors between the feeder end and the fault location was measured. This was a direct measure of the distance of the fault from the relay and the time of operation of the relay was dependent on it.

The percentage of correct operations on the British Grid during the last few years varied from 88 to 95, with an average of 92, which, owing to the stringent method of assessment, represented a high standard of performance.

Circuit-Breakers

After the protective system had determined the location of a fault it initiated the operation of the circuit-breaker with which it was associated, which disconnected the faulty unit by removing a short length of the conductor so as to produce a break in the circuit. This apparently simple problem presented many difficulties, which had been accentuated by the great increase in transmission voltages, by the vast concentrations in fault power and by the high speeds of operation required. Circuit-breakers were being made in Great Britain rated at 275 kV and capable of interrupting 7,500 MVA.

The lecturer then described, with the aid of a film, the construction and operation of three basic types of circuit-breaker, namely the oil, the air-blast and the air-break.

Colour in

SHOULD THERE BE

By W. A. STICKLEY

THE fluorescent lamp provides an economic means of producing sufficient artificial light to see clearly after dark or in places not reached by light from the natural source. With more artificial light has come a greater consciousness of colour. Unfortunately the variety of so-called "white" coloured fluorescent lamps has created a state of confusion to the point where the user may wonder whether any fluorescent lamp can provide the right colour of light. To this is added the more apparent than real problem of the change of colour with a change of surrounding air temperature in which the fluorescent lamp must work. This latter problem, although of interest in certain specialised fields should not influence the ordinary user for one can hardly visualise any violent changes of temperature in modern places of business. A large building would not be subject to violent changes of temperature and smaller commercial premises will be forced by human considerations to maintain a reasonable temperature.

Fig. 1. Part of a large building where great variations in temperature would not be expected and fluorescent lamps would thus be working under optimum conditions. Fluorescent fittings by Ekco-Ensign. Photographs, Singer Sewing Machine Co. Ltd.

Solution to Colour Problem

The real problem of the effect of artificial light on colours will be mostly solved when users accept one colour of fluorescent lamp. The 3,500°K white lamp (Fig. 2) is now recommended for general illumination and it may become the future standard white light source, for little colour distortion can be noticed when it is correctly applied. What little distortion there is will not be objectionable, for the eye can be very adaptable if given a reasonable yard-stick with which it can establish values. This article is a survey of some of the features which affect the light output and colour of fluorescent lamps and the relationship of such effects to visual acumen.

The use of some of the terms normally associated with problems of colour and colour measurement have been deliberately avoided for space limitations would exclude any detailed definition of terms whose significance in this field are not generally known. Emphasis is, however, placed on the cause and effect of variations in the amount of light in given situations, for apparent colour changes are frequent changes of quantity rather than quality of light.

Before the advent of modern lighting it was not possible to see after dark more than outlines and shapes with some degree of colour and this latter only within a limited range of the then very poor light from oil or gas lamps and, as already stated, with the comparatively new facility of being able to see by artificial light has come a greater awareness of colour. This is understandable, for in nature large areas of bright coloured flat surfaces are rarely seen in the same close proximity in which coloured walls, materials,

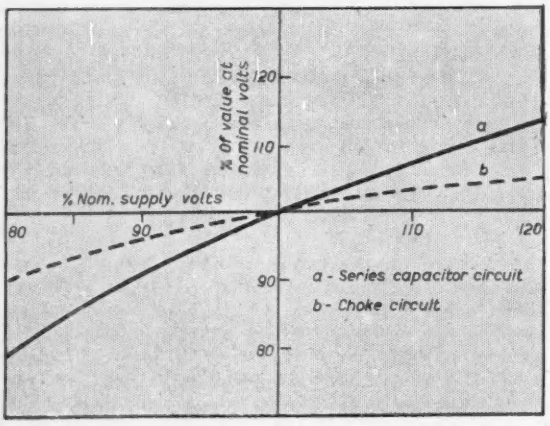


Fig. 4. Mains voltage variations likely to be met with are ± 6%. Therefore from the above graph light output will vary by an amount approximately similar, on a percentage basis, to mains variation in the case of a choke circuit (b). In the case of the series capacitor circuit (a) the variation of light will be much less. These curves were established using an 80 W 5 ft fluorescent lamp circuit

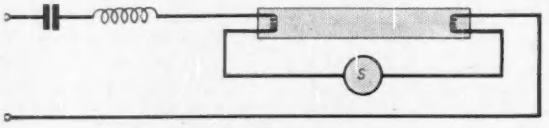


Fig. 5. (top) Series capacitor circuit (leading) which is normally a part of a twin lamp arrangement. It has a better mains voltage acceptance than the standard choke or lagging circuit

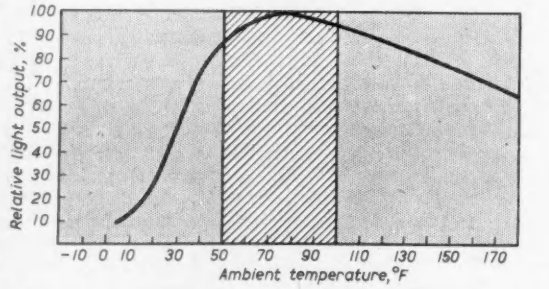


Fig. 6. Variation of the light output of a 4 ft 40 W lamp with ambient temperature. The hatched portion indicates enclosure temperatures aimed at by fittings designers

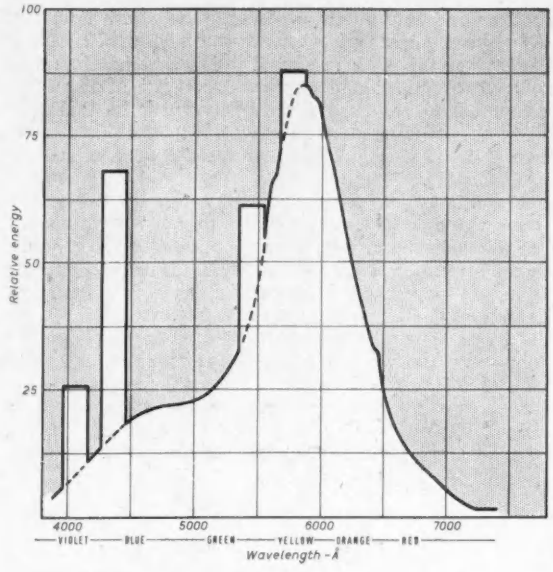


Fig. 2. The spectral energy distribution of a 3,500° K white fluorescent lamp. All the colours of the "noon sun" are present but deficiencies of some colours, particularly in the red region, result in slightly less pleasing appearances of red and pink materials

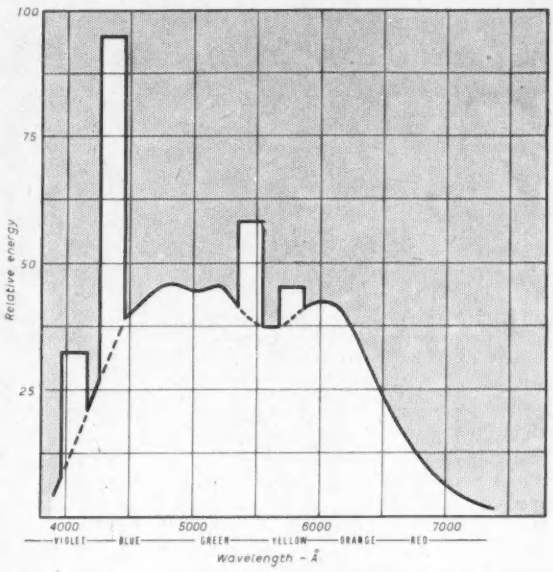


Fig. 3. The spectral energy distribution of a northlight fluorescent lamp. The light from this lamp approximates winter daylight and is used extensively for "colour matching" purpose. It is not, however, normally recommended for general lighting

Fluorescent Lighting

A SINGLE STANDARDISED LAMP FOR WHITE ?

advertisements and other products of our more artificial living are viewed. It should also be noted that the streets of our cities are little more than roofless corridors lighted by the sun during the day and a variety of coloured lamps by night whose peculiar light output effect has added further to the controversy of artificial light sources.

The earlier fluorescent lamps provided the means of obtaining sufficient light to see clearly but they caused considerable colour distortion. More recent lamps, notably "peach" and "warm white" provide a light which may be flattering to some coloured surfaces but has the reverse effect with others. All of the colours of the "noon sun" are present in the 3,500°K white lamp (Fig. 2) and, although there are deficiencies in some of the colours, it has been found in practice to be a very good general purpose lamp. The "northlight" lamp whose spectral energy distribution is shown in Fig. 3 has an industrial application but is not considered suitable for general lighting, for, as its name implies, its colour is "cold."

There are also many colour problems resulting from misapplications. Of two quite usual ones, there is firstly, that of adjacent rooms or other close situations which have sometimes different coloured lamps, for instance, "peach" in one room and 3,500°K white in the other. The lamps for each room may have been chosen for some good purpose but the resulting confusion to the eyes of those people moving from the influence of one set of lamps to the other can be considerable. Different coloured lamps can be satisfactorily mixed but skill in application of such techniques is an essential requirement.

The other problem arises where architectural or other considerations force the lighting engineer to apply more than one size of fluorescent lamp in a given situation. This is not in itself an objectionable feature but there can be a colour difference between lamps having similar phosphor coating but different power loading. This colour difference is only noticeable when bare and adjacent lamps are directly viewed but if the quantity of the light is properly controlled the effect will not be appreciable.

Changes in lamp performance are sometimes quoted as a cause of changes in the appearance of colours but a study of the lamp performance in service indicates that this is not so to any degree.

Lamp Performance

A number of factors influence fluorescent lamp performance. Some of these are inherent, others of design, but two factors—lamp operating current and lamp wall temperature—are service conditions and largely outside the control of the lamp designer. Although these are separate effects they are interdependent, for a change in either will alter the other and will affect the ultra-violet radiation and light from the arc, resulting in a change of light output and colour. If there is no great change in the current density of a low pressure discharge lamp then the arc will remain stable for most of its useful life and light output and colour will not vary to any appreciable extent. In service arc changes will normally be as a result of either variations in the mains supply voltage or variations in the ambient temperature.

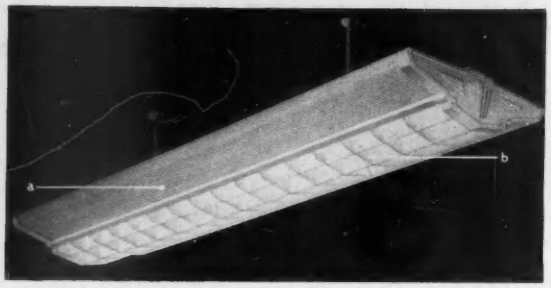


Fig. 7. The temperature near the lamps in this twin 80 W fluorescent fitting is not normally excessive for the heat containing properties of the diffusers (a) are balanced by the airflow through the louvre (b)

The improvement in power supply which has been noticeable over the past three years leads us to expect a mains pressure well within the ± 6% variation. Fig. 4 shows that variations in mains voltage of this order are easily accepted by the normal fluorescent lamp circuit with quite small changes in light output. The series capacitor circuit, Fig 5, has a better acceptance of mains voltage as can be seen from Fig. 4. It will be clear therefore that whatever fluorescent lamp is used the colour and its light output will not in service be expected to change hour by hour due to varying mains voltage.

The other cause of changing lamp current is the variation of ambient temperature. Thus, if a fluorescent lamp be operated on a stabilised mains supply and a stream of cold air be passed over the lamp the vapour pressure inside the lamp decreases with an effect on the arc. If, however, this same lamp is enclosed by, for instance, a "Perspex" housing then the lamp energy will cause a temperature rise in the air so trapped and the lamp temperature and vapour pressure within is no longer at optimum. Fig. 6 shows the temperature variation that a fluorescent lamp can tolerate with only small changes in light output and fittings designers aim at surrounding temperatures of 50° F. to 100° F. for good lamp operation.

Ambient Temperature Control

When bare lamps are used no control of ambient temperature will normally be possible but where draughts or other specialised conditions exist and cause variation of light with consequent changes in colour, the user can correct this condition by fitting suitable enclosures. Enclosures may be used with fluorescent fittings for light diffusing purposes in situations where no cold air or draught conditions exist. The lamps in the twin 80 W fittings, Fig. 7, operate at correct temperature for there is a balance between the warm air contained by the diffusers (*a*) and the air circulating facility of the louvre (*b*).

It is possibly of interest that this particular condition was met in the lighting of a refrigerator. Here the lamp was required to be at the top of the refrigerator and, in this case, in the path of its coldest air stream. The lamp was therefore brought to the optimum condition by fitting an enclosure and decreasing the impedance of the choke and thus allowing a greater energy output from the lamp to compensate for the loss of heat due to refrigeration. It can therefore fairly be claimed that well designed and properly installed fluorescent lighting can provide the light necessary for "good seeing" without serious colour distortion.

If the period before modern lighting became available is again reviewed it will probably be accepted by most that the colours of interior decorations and furnishings were rarely chosen with any reference to artificial light. In general, the places designed for use after dark, such as theatres and restaurants, had furnishings which were of the gilt and plush variety and very rarely pastel shades of colour. It was with modern lighting that interiors were brightened and with the greater reflectance of the lighter coloured walls and furnishings has come the realisation that quite small errors in the choice of the colours used can have a marked psychological effect and such effects can be distressing.

Unfortunately attempts to make use of the various pastel shades of fluorescent lamps to make more pleasing the colour of the surroundings has resulted in the condition already mentioned where two adjacent rooms or other situations may have two distinct light sources which results in confusion. A standardised white fluorescent lamp, therefore, appears to be essential and even if that lamp has some comparatively minor distorting qualities, as has the 3500° K white, the designer of interior decorations will at least have a standard light under which he can choose his colours and will know clearly what those colours will look like under the same standardised artificial light.

Interior Lighting Studies

LAST Tuesday, Mr J. M. Waldram presented a paper to the Illuminating Engineering Society on "Studies in Interior Lighting." This paper was a contribution to the study of interior lighting discussed in the report of the sub-committee of the British National Illumination Committee published recently in the I.E.S. Transactions under the title "The Design of the Visual Field."

Three basic parameters affect the mechanism of interior lighting. These are the light released in the interior, the geometry, and the reflection properties of the surfaces involved. They interact in several stages to form a "gross pattern of luminance and chromaticity."

In many situations values of luminance are quite anomalous as judged by visual impressions. It has, however, been found that the scale of apparent brightness derived by Hopkinson, and which takes into consideration the effects of adaptation, results in reasonably consistent numbers which link together experience in many different situations ranging from full daylight outdoors to street lighting. From the curves defining the scale it can be seen that there should be a rather insensitive range of absolute level, which diminishes with increasing luminance and vanishes altogether in the levels found in full daylight outdoors. The curves provide means for translating apparent brightnesses into luminance and *vice versa*. Figures of apparent brightness can be used to express the intentions of the architect in any interior and they can then be translated into luminance. It has been found that by starting with apparent brightness and deriving the installation, the complexities of the problem can be minimised and inter-reflection theory avoided.

The revelation of form and texture is a function of the spatial distribution of the incident light, and investigations carried out on a standard polyhedron structure have shown two characteristic patterns, one of which is typical both of overcast daylight outdoors and of most artificial interior light installations, and the other typical of outdoor sunlight and of indoor daylight.

This work may provide new means whereby the designer could express and realise his purpose, but it should be remembered that purpose in the design of an interior involves the architecture, the decoration, the furnishing and the lighting, and unless they are harmoniously combined in a common and clear architectural purpose, refined design of any of them is pointless. Here the lighting engineer must turn to the architect for help.

notes on wiring

by Megohm

READING through an American "electrician's handbook" the other day, I was struck by the familiarity of the practical problems which the author felt it necessary to discuss. Most of the details of installation equipment, and the wiring rules to which it was to be installed, were, of course, rather different from what we are used to on this side of the Atlantic, but pressing up through these differences came the elementary questions of technique with which electricians in all parts of the world are concerned. Removing insulation from a cable without nicking the conductor; drawing in cable to conduit; jointing and splicing cables, and many more.

One of the details which particularly attracted my attention, because of a recent experience over here, was the well worn recommendation that care should be taken to leave no rough edges at the end of lengths of tubing. The emphasis in the American book was on the use of a reamer for this purpose, though a rat tail file will do just as well. What is important, is that attention should be given to each end of every length of conduit that is cut. There is a gap in the usually comprehensive I.E.E. wiring rules on this point. The appropriate regulation, 405(g), merely requires that "every outlet for a cable from a conduit shall be bushed or so finished as to prevent abrasion of the cables emerging therefrom."

Just why the regulation stops at this, I am not certain. Perhaps the answer is that it would be difficult to inspect intermediate points which are effectively enclosed in couplers. However, there is no doubt that as my American author points out, there is some danger of abrasion at every conduit end, unless steps are taken to chamfer the ends which cutting may have turned in and not only at outlet points—though the risk of serious abrasion is admittedly greatest there. I was interested to find that this American book carried the matter further, by issuing a warning against screwing conduit lengths too tightly together after they have been prepared. If care is not taken to avoid this, then the sharp edges may after all be turned in, and the previous care count for nought.

Safety at School

There was an almost American touch about one of the items of news that I noticed in last week's ELECTRICAL TIMES. This was the story of Chester's decision to convert its school installations to 110 V working. I wonder how far this move will extend? According to the published details, the advice of some Government official, department unknown, has been enough to frighten the responsible education department into this retreat from 240 V. Although I have a great respect for the destructive ability of children—I have seen what they can do to some sturdy apparatus at exhibitions—I feel that opportunity for exercise of this particular gift is likely to be lacking where portable appliances used at schools are concerned; and presumably it is these that worry the education authority.

The whole story reads indeed, as though someone has been impressed with the well justified propaganda that is put out for the use of 110 V for portable tools in industry. No doubt the extension of this practice to schools would provide some remunerative and interesting work for many of us, but it would have the balancing disadvantage of making electricity unnecessarily more expensive. Incidentally, could it not also be argued that any decrease in the shock risk would be counter-balanced, to some small extent, by an increased fire risk arising from the introduction of several transformers.

Inspection the Answer

There is one interesting question raised by the incident —I call it that because I doubt if it will prove of more permanent significance—and that is, what are the circumstances in which a departure from the standard 240 V should be recommended? The usual working kitchen, for instance, is potentially more dangerous than most schoolrooms so far as shock risk is concerned, yet children are usually wandering in such surroundings at well below school age, and I doubt if many of us feel the need to introduce step down transformers for the cooker, the washing machine or the electric iron.

In fact, I can think of few non-industrial situations in which I would recommend a customer to consider the use of a special voltage; but I often wish that there were better opportunities of persuading him to have his whole installation looked over. It is all too easy to forget when discussing this question of special voltages, that if earthing and fusing arrangements could be relied upon, then there would be no need to go to the inconvenience of a lower voltage anywhere. And the best way of approaching reliability is regular inspection, with intelligent action based on what is found.

Visual Bonding

Of course, there is a big variation from installation to installation in the ease with which an inspection can be carried out. This was brought home forcibly some little while ago when I was in a factory where particular care had been taken with the earth continuity arrangements, These always seem to me to provide an outstanding opportunity for the careless electrician to get away with something below par. Especially is this so where bonding connections are concerned.

In the case I have in mind inspection was facilitated by having all strips used for bonding picked out in a distinctive colour. The effect was most reassuring, for not only was the presence of separate connectors across flexible conduit, etc., immediately apparent but also there was a continuous reminder of the importance of the arrangement for bonding. If any particular strip was disconnected during alterations, it cried out itself for reinstatement. How different is this from the short lengths of inconspicuous v.r.i. that are often seen trailing from a machine frame. The use of the distinctive colouring seemed to me well worth while, and altogether an idea that might be more widely applied with advantage.

Earthing in Practice

PART II*—INSTALLATION AND MEASUREMENTS ON ELECTRICITY SUPPLY SYSTEMS

By R. W. RYDER, B.E., B.SC., A.M.I.E.E.

THE use of earthing is so widespread in the supply industry that at practically every point in the system, from the generators to the consumers' equipment earth connections are made.

The primary function of earthing is to provide protection against the dangers to human life and property associated with the use of electrical energy. There are, however, other uses to which earthing is applied such as stabilisation of voltage conditions and protection against lightning. Each of these applications calls for special characteristics which it is hoped to cover broadly in this article.

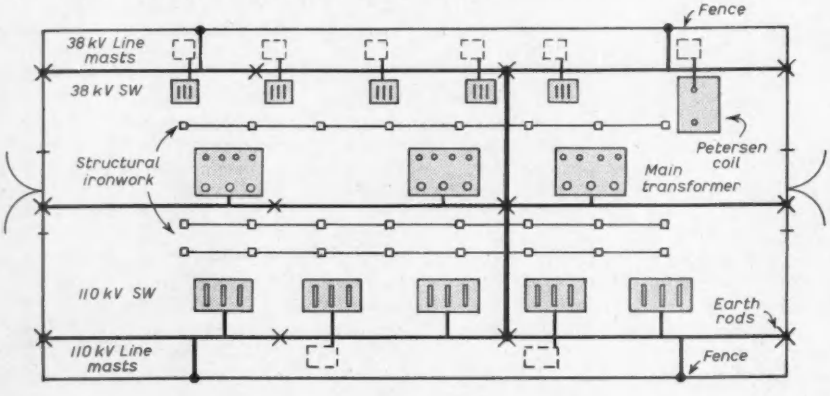
High Voltage Earthing

A low resistance earth is required at all generating and transformer stations and all non-current carrying metal is normally connected to it. The purpose of this low resistance earth is to ensure that all such metalwork is at the same potential, so as to avoid danger to operating staff and also to provide an adequate path to earth for such fault currents as may arise. The earthing installation must be such that (*a*) no undue rise in potential will occur when fault currents flow; (*b*) all earth continuity conductors must be of adequate cross section so that no undue temperature rise will occur under fault conditions; and (*c*) the connection to earth must be such that the fault currents can flow to earth for the period required without the drying out of the soil in the immediate neighbourhood of the earth electrodes.

The earthing system should be spaced, if possible, over the full extent of the station site. All steel towers and underground cable sheaths should be securely bonded to the electrode system in addition to all station framework, fencing, generator and transformer frames. Fig. 1 shows a typical earthing installation for a high voltage transformer station handling 110 kV on the primary side and 38 kV on the secondary.

(*Continued from page 20 in 7th January issue*)

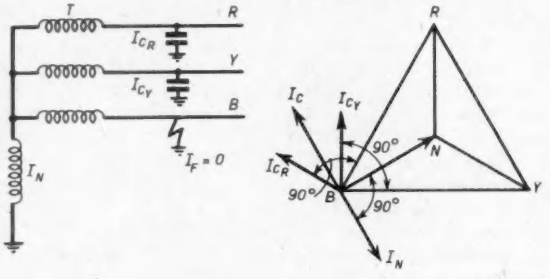
Fig. 1. The earthing installation of a high voltage substation should be spaced across the whole site as shown in this diagram of a 110/38 kV transformer station on a Petersen coil earthed system



The earthing installation in high voltage stations is also used to limit the rise in potential on live apparatus. The neutrals of generators and transformers are connected to the station earthing system either directly or through a resistance, a reactance or an impedance which may have a fixed value or be tuned to the feeding conditions present.

In some cases separate earthing installations are used for this purpose but there is no doubt that a much more satisfactory solution is to use the one earthing system for all purposes. If the same money is spent on this single earthing installation as would otherwise be spent on two separate installations a more efficient earth is obtained.

Fig. 2. Vector diagram showing currents that flow in an arc suppression coil during a single phase fault



The following are the usual values of resistance aimed at for various purposes in Ireland:

Generating Stations	0·5 ohms or less
Transformer Stations (over 100 kV)	1·0 ohms or less
Transformer Stations (over 38 kV)	2·0 ohms or less
Transformer Stations (over 10 kV)	20·0 ohms or less

In general the earthing installation is only called upon to carry fault currents for a very short time depending on the setting of the earth protection relay which operates to interrupt supply to the affected apparatus. There is, however, one important application which calls on the earthing installation to carry substantial currents for periods up to several hours. This is when the neutral of the secondary winding of h.v. transformers is connected to earth through a variable reactance, known as an arc suppression coil.

In the event of an earth fault on one phase of the associated transmission system, the displacement of the neutral voltage due to the

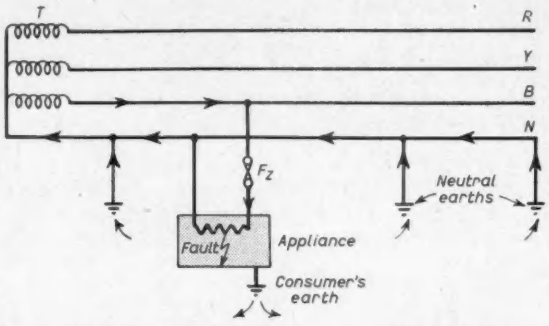


Fig. 3. Where direct earthing is used on a multiple earthed system the sum of the resistance in circuit must be low enough to permit the overload device to operate. The current paths are indicated above

fault causes an inductive current to flow through the arc suppression coil to earth equal to the sum of the capacitive currents of the two healthy phases which would otherwise flow through the point of fault. As a result, the current flowing through the fault is reduced almost to zero and the fault arc is rapidly extinguished, minimising the actual damage done and preventing the development of the fault into a short circuit.

Fig. 2 shows the vector and schematic diagrams under earth fault conditions in which I_c is the capacitive current which is balanced by I_n the inductive current in the arc suppression coil.

The coil should be tuned to three times the earth capacity current of one phase of the transmission system to which the coil is connected. When alterations are made in the length of the transmission system either by the addition or switching out of substantial lengths of line, the tuning of the coil must be altered.

One disadvantage of this system is that when an earth fault develops on one phase, the voltage of the other two phases rises to $\sqrt{3}$ times its normal value. This sometimes leads to a further breakdown on one of the remaining healthy phases, resulting in a two-phase short circuit and the tripping of the switch feeding the fault farthest away from the main station. If this tripping disconnects a substantial length of transmission line from the system, the tuning of the coil is now unbalanced and there is a danger that a heavy fault current will pass through the original fault, a condition which may cause serious damage to equipment.

This system has been in use on the Continent and also in Ireland for many years and has given general satisfaction. One of the principal advantages is that momentary earth faults due to lightning are rapidly extinguished and do not result in as frequent interruptions as would otherwise occur. In addition when an earth fault occurs it is possible to continue feeding on the lines involved while steps are taken to sectionalise the faulty plant and make suitable arrangements for alternative feeding of the load affected.

Lightning Protection

Where the incidence of lightning is great and the plant concerned is valuable efforts are made to give a measure of protection against the disastrous effects due to this cause. In all methods used to achieve this purpose, earthing plays a very important part.

In h.v. stations lightning rods are usually placed on the top of structural masts to divert direct strokes, and air gap rods are placed on transformer and switch bushings which are set low enough to ensure that any lightning surge reaching the plant concerned will discharge itself through the gap rather than across the bushing. In both the above methods the discharge takes place through the station earthing system which has already been described.

In the case of h.v. lines the usual methods adopted to give protection against lightning are: (1) Erection of earth wires over the live conductors; (2) reduction of earth resistance of each individual steel tower; (3) installation of a counterpoise earth.

Earth wires are usually erected above the live conductors of overhead transmission lines. These earth wires are earthed at various points along the line and it is essential that a low value of resistance is obtained.

Where steel towers are used to carry the transmission line, each tower should be solidly bonded to the earth wires. Where wooden poles are used as supports the case for erection of earth wires is not so strong, as it will be necessary to install separate earth electrodes, and the earth leads connecting the earth wire to these electrodes will counteract the insulation value of the wooden poles which would otherwise provide a measure of protection in themselves.

Where efforts are being made to reduce the earth resistance of steel towers it should be remembered that any

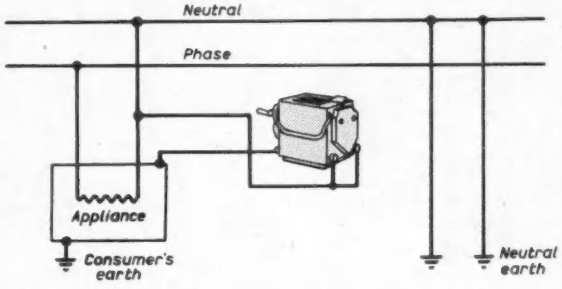


Fig. 4. Connection of earthometer for the measurement of the total impedance of an earth circuit

additional electrodes should be placed outside the resistance area of the legs of the tower itself as otherwise the full benefit to be derived by this method will not be realised. Steel towers are usually at least 7 ft in the ground so that the additional electrodes should be at least 14 ft from the nearest tower leg, and they should be connected to the tower by heavy copper leads or galvanised strip buried at least 18 in. below the surface.

Two different forms of counterpoise are in common use in the United States as a means of providing protection for overhead transmission lines. They are—(1) the continuous type, in which a horizontal wire is buried under the transmission line throughout its length, and (2) the radial type, consisting of a number of buried wires radiating from each steel tower and separated from each other by equal angles.

This method is used mostly in areas having high resistivity where the incidence of lightning is high, and its purpose is to reduce the resistance of the steel towers and to increase capacitative coupling of conductors to earth.

Low Voltage Earthing

In large cities supply is usually given by means of an underground cable network consisting of three-phase four-wire cables for distribution, with single-phase tee-jointed service cables to individual consumers.

Earthing problems in such networks are very rare, as the supply company has at its disposal a very low resistance in the lead sheaths of the underground cables and consumers generally have a low resistance water main to which connection can be made of all metalclad appliances, thereby providing effective protection against earth faults.

It is in the smaller towns, however, and particularly in rural areas where supply is normally given by means of an

overhead network that major problems arise with regard to earth protection.

Where direct earthing is used on such networks the supply authorities must provide a low resistance earth connected to the neutral wire of its three-phase network and the consumer must also provide a low resistance earth for metalclad appliances if full protection is to be obtained.

It should be remembered that where this type of earthing is used both the consumer's earth and the neutral earth are in series in the fault circuit (see Fig. 3) and therefore the added resistances of these two earths must be low enough to allow the fuse or other overload device protecting the faulty apparatus to operate.

A frequent method of providing a low resistance earth on the neutral wire of the distribution network is to install numerous earth electrodes throughout its length. These electrodes are usually placed on every fourth or fifth pole and naturally extend over a very wide area. Efforts are sometimes made to measure the neutral resistance to earth

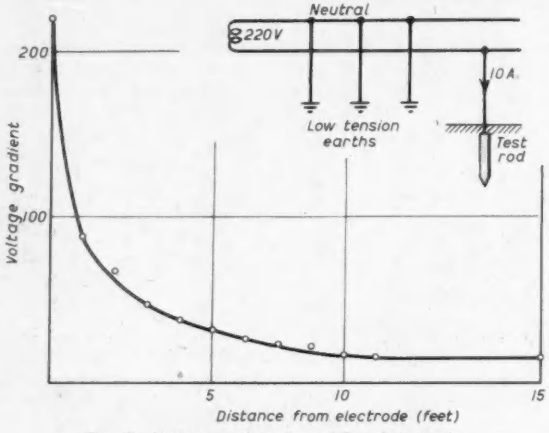


Fig. 5. Voltage gradient for a 6 ft rod electrode

by using the standard earth tester spacing the auxiliary electrodes 40–50 yds apart. The results obtained by such tests are most unreliable as in order to obtain reasonable accuracy, the auxiliary electrode spacing should be at least eight times the extent of the earth installation under test which in this case would amount to several miles.

What is much more valuable as a test is that obtained by use of the earthometer, a modification of the "Megger" earth tester which gives the total impedance of the fault circuit which includes the neutral and consumer earth resistances (see Fig. 4).

This test can also be carried out with the standard earth tester by looping the "P" and "C" terminals together and connecting the joined terminals to the consumer's earth and the "Earth" terminal to the neutral of the supply system.

Alternative Methods of L.V. Earthing

Where direct earthing cannot be used because no suitable consumer's earth is available, various methods are used to provide protection. The principle methods employed for this purpose are:

(1) Earth leakage or core balance relays.

(2) Neutralising, i.e. connecting the metalwork of consumer's equipment to the neutral of the supply network.

(3) Separate earth wire, in which case an additional conductor is added to the network which is connected to the neutral of the transformer at one end and to the metalclad equipment in the consumer's premises at the other.

(4) Protective multiple earthing or "nulling" in which case the neutral, earthed at various points along its length is connected to metalclad equipment in consumers' premises where an additional earth must also be provided by the consumer.

The earth leakage switch has been in general use in rural areas for a number of years, but it is feared that in many cases after some time, this device becomes defective and ceases to provide the protection required.

In the author's view, the most satisfactory solution to this problem is the use of a separate earth wire which unfortunately has, as yet, only limited application owing to economic considerations. This method has been used in a number of cases where the substation is erected close to a factory, as a means of protecting the electrical installation in the factory and has proved very satisfactory.

In general, the most practical solution to this problem is the widespread use of protective multiple earthing. The principle advantages of this system are that (1) the supply company has complete control over the earth installation and (2) the method of protection is extremely simple as no additional equipment is required.

One of the disadvantages cited by opponents of this method of protection is the dangerous consequences of a break in the neutral wire which could result in a very high potential appearing on the consumer's appliances. It is felt however, that although such breaks do occasionally occur, due mainly to poor construction, it should be possible to eliminate them by using properly designed connectors and providing lock nuts at all terminal connections.

Voltage Gradient

While it is true to say that if the resistance of an earth electrode system is low enough the installation will carry out its duties satisfactorily, there are nevertheless two special characteristics of earth electrodes which are worthy of further consideration. These are (1) voltage gradient around current carrying electrodes and (2) current carrying capacity.

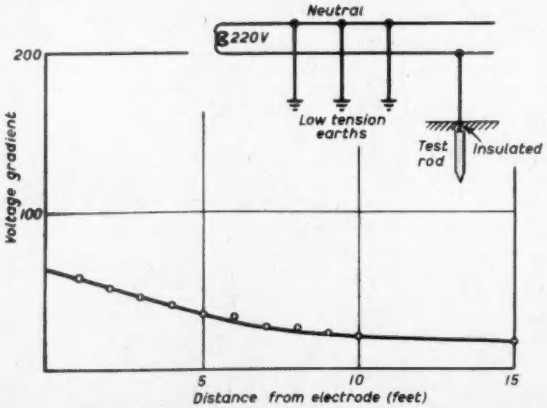


Fig. 6. Voltage gradient for a 6 ft rod electrode when an insulated lead is used and the top of the rod is at least 12 in. below the surface. Test results are shown by circles

Since the resistance of an earth electrode is distributed over a limited area close by it follows that when current is passed through the electrode a voltage drop will appear on the surface of the ground within this restricted area. This voltage drop (or gradient) can produce very dangerous conditions, especially where electrodes are located in open fields, frequented by livestock or where isolated earths are situated on frequented pathways, as it is possible that such dangerous voltage could be applied between the front and hind legs of an animal or even between the legs of a human being walking in the vicinity.

Fig. 5 shows the results of a test carried out with a 6 ft rod driven into the ground with the top of the rod at

the surface. A voltage of 220 V was applied to this rod and the circuit was completed through a very low resistance earth (below 1 ohm) on the neutral of the supply system.

It can be clearly seen that a horse or cow standing with hind legs at B and with fore legs at A could have a voltage of 180 volts applied between these points which would almost certainly result in a fatal shock.

By ensuring that the top of the rod is placed at least 12 in. below the surface and using an insulated lead between the rod and the surface this dangerous condition can be almost completely eliminated. Fig. 6 shows the result of tests with such an earthing installation.

It will be seen from this diagram that under the same conditions as those mentioned above the voltage applied between the fore and hind legs of the animal is reduced from 180 volts to 30 volts which would be reasonably safe.

The danger due to voltage gradient on current carrying earth electrodes is most pronounced where single earth rods are used. By using a number of electrodes in parallel the effect is also further reduced.

When current is flowing through a resistance heating results due to the dissipation of electrical energy. The amount of heat generated by a resistance of R ohms with a current of I amp flowing is I^2R watts. In the case of an earth electrode this heating effect is concentrated within a few feet of the electrode itself. As a result the moisture in the soil tends to evaporate, and if the current carrying capacity of the electrode is exceeded the evaporation will increase to the point where the resistance will start to increase. The drying out of the soil is counteracted, to some degree, by the natural tendency of moisture to travel from a position where soil is wet to where it is dry. If, however, the evaporation due to the heating effect is greater than the influx of moisture due to capillary action, the resistance of the earthing installation will increase rapidly and dangerous voltage conditions are likely to arise.

This failure of an earthing system can be produced in a short time if large currents are applied or in a much longer period, up to several days if the current is reduced. In general, this effect can be eliminated by increasing the surface area of the electrode. The most economical method of achieving this result is to drive additional rods which will have the added effect of reducing the resistance still further and therefore increasing the possiblity of the fault producing such currents being removed from the system.

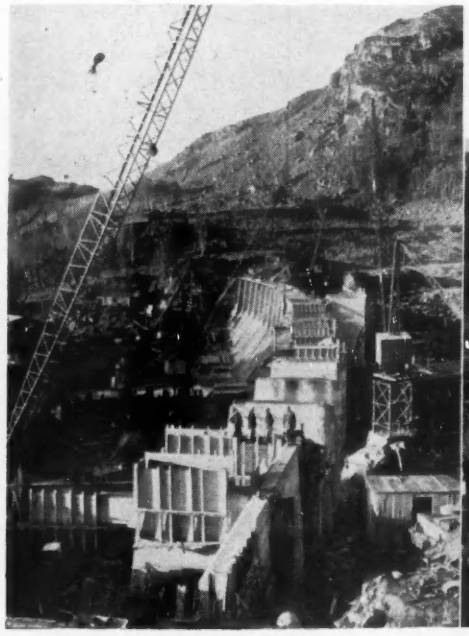
(To be Continued)

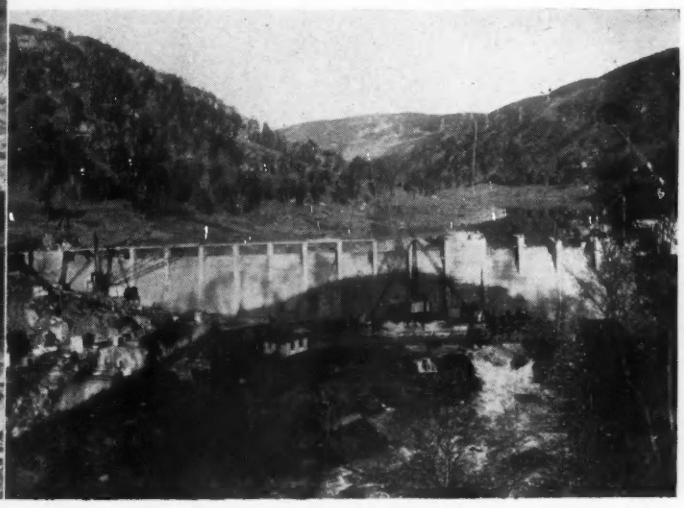
CONON VALLEY PROJECT PROGRESSES

AFTER some delay due to restriction on capital expenditure, work is now going ahead at full pace on the Conon Valley scheme of the North of Scotland Hydro-Electric Board. The total scheme involves some seven dams and six generating stations with an estimated output of about 442 million units per annum. The main development is the Glascarnoch-Luichart-Torr Achilty scheme with a catchment area about 345 square miles. The capacity of the three main stations constituting the group are Glascarnoch, 2×12 MW; Luichart, 2×12 MW, and Torr Achilty, 2×7·5 MW. A dam is to be constructed in Strath Vaich to form a new reservoir, and water will be taken from this lake to a second loch formed in the Glascarnoch river valley by a dam near Aultguish Inn. A five-mile tunnel then conveys the water to Glascarnoch generating station near the head of Loch Luichart.

A barrage is also being constructed at the outlet of Loch a'Chuilinn in Strath Bran, and will supply water to Achanalt station (1×2 MW) near Grudie Bridge.

Near Curin, on the river Meig, a further dam is being built and a tunnel will convey the water to Loch Luichart. The level of this lake is to be raised by the building of the dam, shown under construction in the photographs, and another tunnel takes the water to Luichart generating station at the junction of the rivers Conon and Meig.





These two photographs, taken by a staff photographer of "The Scotsman" show the progress on the dam at the eastern end of Loch Luichart. A tunnel will run from this point to Luichart generating station.

A.C. Measurements at High Sensitivity

Master metering for network analysers using dynamometer instruments and amplifiers

By H. D. Hawkers,* M.I.E.E.

THERE is at present little demand for very high sensitivity measurements (r.m.s.) of voltage, current and power in the lower power frequency ranges. The reflecting type of ironless dynamometer instrument gives an excellent performance over the frequency ranges 0—2·5 kc/s and its power consumption is sufficiently low for most practical purposes. There are, however, times when high sensitivities are necessary and the use of amplifiers are unavoidable. When they are used in conjunction with the reflecting dynamometer it is usual to employ, as primary components, for the voltage measurements, resistance dividers of not less than 10,000 ohms/V and shunts for the current measurement having a nominal volt drop of 10 mV. Thus for a wattmeter having nominal ranges of 10 V, 50 mA the power consumption on the voltage side is 1 mVA and that of the current side 0·5 mVA.

The big advantage of using amplifiers is that a number of instrument voltage or current circuits may be supplied without increasing the power consumed from the circuit under test. One application of the use of dynamometers in conjunction with amplifiers has been for master instruments in power network analysers and an account of the arrangement of these instruments and their performance may serve to indicate the possibilities of these high sensitivity measurements for other applications.

Analysis of power frequency (50 c/s) networks is carried out by simulating these networks at low voltages and at a higher frequency (between 500 and 1,500 c/s). The instruments may be connected into any part of the simulated network and may be at earth potential or at the maximum network potential above earth. Measurements of volts, amps, watts and reactive volt-amps are desirable. The power consumed by the measuring apparatus must be sufficiently low that the network conditions are sensibly undisturbed. If nominal voltage of the network is, say 25 V and the nominal current 50 mA then the total burden of all instruments should not be greater than 25 V, 0·05 mA on the voltage side and 50 mA, 25 mV on the current side.

There are three main components in the measuring circuit (*a*), primary measuring components (*b*) amplifiers and (*c*) indicating instruments. The arrangement shown in Fig. 1 is for a fixed frequency, current measurement being made with a large number of 0·2 ohm shunts distributed within the network. Any one shunt is selected and coupled to the primary of a screened voltage transformer having a rate of 1/1. The transformer has a phase angle of not greater than five minutes. For voltage measurement, the primary component is a small screened voltage transformer with nominal ratio of V/2, the phase angle of these transformers being usually not greater than ten minutes.

The instrument arrangement shown in Fig. 1 for measurement of amps, volts, watts and vars, although suitable for fixed frequency only, has the merit of providing a set of instruments which can be checked independently to the rest of the measuring circuit.

The voltmeter and ammeter are "standard" reflecting dynamometers, the former having a full scale deflection (f.s.d.) of 50 volts and the latter of f.s.d. of 50 milliamps. The voltmeter is frequency compensated and the milliammeter is sensibly independent of frequency error.

(Mr Hawkes is with Elliott Brothers (London) Ltd.)

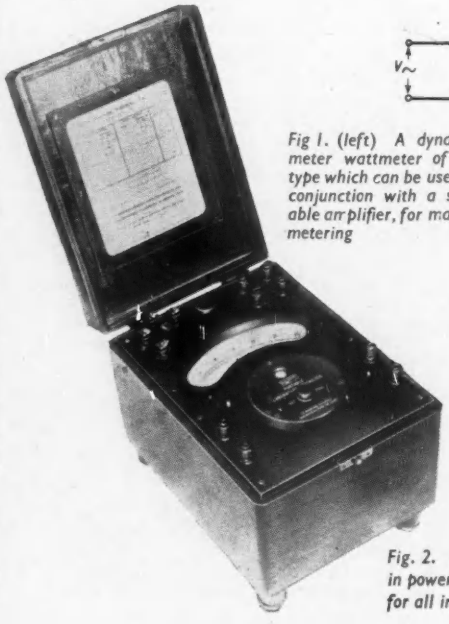


Fig 1. (left) A dynamometer wattmeter of the type which can be used in conjunction with a suitable amplifier, for master metering

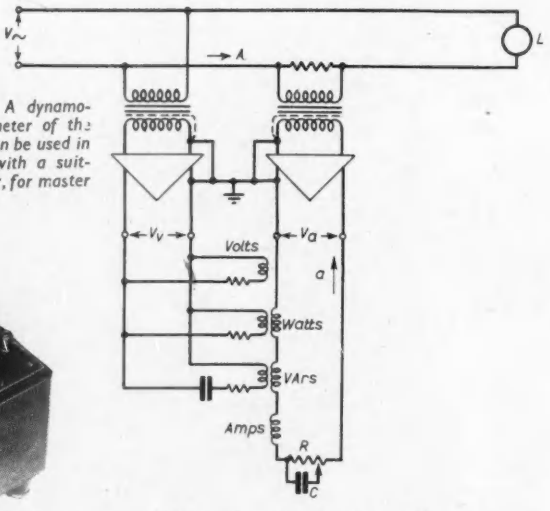


Fig. 2. Diagram of the circuit used for making master measurements in power network analysers showing the derivation of the amplified supply for all instruments

The wattmeter and varmeter have current windings for 50 mA and "standard" wattmeter moving coils wound for a nominal current of 1·25 mA. The current windings of the ammeter, wattmeter and varmeter are coupled in series and built out by R to 1,000 ohms. Partial compensation for the inductance of the circuit is obtained by C so that at the nominal frequency the instrument current (*a*) lags Va by a few degrees only. The phase of the currents in the voltage coils of the wattmeter and varmeter are suitably adjusted to give true Vv. Va cos θ, and Vv. Va sin θ calibration, respectively.

By selection of the ratio V/Vv and relation A to Va, all instruments can be made to give f.s.d. for any nominal values of V and A. The R-C compensation shown in Fig. 1 may be made adjustable to cover a small range of phase displacement of (*a*) without appreciable change in its amplitude. This adjustment can be very useful for correction of any small angles in the amplifiers or primary components. If Vv and Va have the same nominal value and this is supplied from a single source at the fixed frequency, then volts, amps and watts will indicate f.s.d. and vars will read zero.

Instrument Amplifiers

Instrument amplifiers are essentially precision units with a nominal output of 50 volts. The gain of the amplifier supplying the voltage side of the instruments is 25 and that supplying the current side 5,000. The 25 gain amplifier is a two stage RC-coupled amplifier with feedback applied from the anode of the last valve to the cathode of the first valve. The 5,000 gain is a five stage amplifier with one push-pull stage and is coupled to the load with a low capacitance transformer. It has two negative feedback loops, one from the output transformer secondary to the cathode of the third stage and the other from the anode of the second stage to the cathode of the first stage.

Each amplifier has a phase displacement between input and output voltage of not greater than ±5 minutes under nominal load. The total harmonic content of the output is not greater than 0·25 V and the hum and noise level is less than 50 mV. The long term stability of either amplifier is not worse than 0·1% of nominal output. This performance is only obtained by careful design and choice of components. The use of electrolytic condensers is avoided, whilst separate heater supplies are provided for each amplifier to avoid interaction All resistances carrying valve currents are wire wound, whilst others are stabilised carbon. Manganin resistances are used in feed-back circuits.

Overall Burden and Accuracy

For an arrangement as described, with nominal ranges of 25 V and 50 mA, the sensitivity on the voltage side is 12,500 ohms/V and the burden on the current side 0·5 mVA. The overall accuracy at a fixed frequency of 1,000 c/s is better than 0·5% of f.s.d.

Where high sensitivity measurements of volts, amps and watts only are required for use over a frequency range, say, service frequencies 333 to 2,500 c/s, then "standard" reflecting dynamometers may be used in conjunction with amplifiers and resistance dividers and shunts for primary measuring components. In this case the amplifier supplying the current side of the instruments has a high impedance output and the output current is directly proportional to the voltage input, that is the voltage across the shunt.

DETERMINING DATA FOR NUCLEAR REACTORS

IN the design of nuclear reactors, as in all engineering design, greater economy and safety in the ultimate plant design is a natural sequence to greater knowledge of the properties of all materials involved. Nuclear reactors, however, present a fresh variety of problems in this respect, and the designer requires a knowledge of physical, nuclear, chemical and metallurgical properties of not only the fissile fuel, but of structural material, control elements and possibly the moderating material. Design ultimately rests upon the effort of specialists in a number of techniques, covering a wide field of investigation.

In the determination of nuclear physics data, one of the important tools in use at the Atomic Energy Research Establishment is the time-of-flight neutron spectrometer, described briefly in one of three papers presented to the I.E.E. Measurements Section last week. Presented under the joint authorship of Messrs. F. S. Goulding, B.SC., J. C. Hammerton, M.A., M. G. Kelliher, B.A., M.SC., A. W. Merrison, B.SC., and E. R. Wiblin, M.A., A.M.I.E.E., the paper is particularly interesting as the spectrometer makes use of the travelling-wave linear electron accelerator as a source of pulsed neutrons.

Briefly, neutron spectrometry is the investigation of the interaction between neutrons and nuclei of elements as it varies with neutron energy. The probability that a given type of interaction will take place is usually expressed in terms of the target area (or cross-section) which the nucleus appears to present to the approaching neutron. As this cross-section varies with the approaching neutron's energy, it becomes important, both scientifically and practically, to measure its area for a range of energies. Several inter-actions can take place simultaneously, each separate process having its appropriate cross-section. In practice, their sum is obtained in any one experiment. Known as the "total cross-section," its value is measured in transmission experiments, performed in this case with the neutron spectrometer.

In a transmission measurement, a beam of neutrons is fired at a sample of the element under test in such a way that only those which pass through (or are transmitted by) the sample are detected. During a given time the number of neutrons transmitted and deleted will be less, obviously, than if the beam were not intercepted by the sample. The ratio of the numbers transmitted in each case gives the transmission of the element in question from which the total cross section can be determined.

To make such transmission measurements, the basic requirements are a beam of neutrons and a neutron detector, together with some method of differentiating between neutrons of varying energies. Were it possible to produce monokinetic neutrons in the intermediate energy range (10 to 20,000 electron volts) the latter requirement would, of course, be non-existent. The method employed in this type of neutron spectrometer, however, makes use of the different times taken by neutrons of different energies to travel over a fixed distance.

Neutrons are obtained for the experiments by means of a linear electron accelerator in which a travelling wave of frequency 3,000 Mc/s is used as the accelerating medium. Accelerated electrons bombard a target of platinum, which emits intense pulses of gamma rays corresponding to the electron pulses. A target of beryllium absorbs most of this radiation, producing intense pulses of neutrons some of which pass along the flight path in which the sample is placed. Those transmitted by the sample are detected by a counter filled with boron-trifluoride gas.

Extensions at Edmonton

OIL EXPLOITATION SENDS DEMAND ROCKETING

SINCE the discovery of oil in the vicinity of Edmonton, Alberta, Canada, the electrical load growth in the city has been abnormal, and in order to keep up with the demand it has been necessary to accelerate the rate of expansion of the Municipality's generating facilities.

Latest addition to the plant is a 30 MW turbo-alternator together with a 20 klb/hr boiler. This was commissioned last October, when Mayor William Hawrelak turned the switch to start initial operation and the Hon E. C. Manning, Premier of Alberta, and Minister of Mines and Minerals, started up the new boiler.

Existing Plant

This extension brings the generating capacity of Edmonton up to 90 MW, made up of two 15 MW and two 30 MW sets. Steam generating capacity now stands at 1,060 klb/hr derived from three gas-fired steam generators of 200 klb/hr each, one smaller gas-fired unit of 150 klb/hr and two coal-fired units of 155 klb/hr. The gas-fired boilers are also equipped with oil firing plant, which can be brought into use in the event of an emergency.

Edmonton has a long history electrically, the first city station having been built as far back as 1891. In 1907, however, the present site was adopted and in 1928, as Mr William D. Kirkland, Superintendent of the power plant mentioned when speaking at the opening ceremony, "a 10 MW generator was installed with the first big steam turbine operating at a speed of 3,600 r.p.m. in the world."

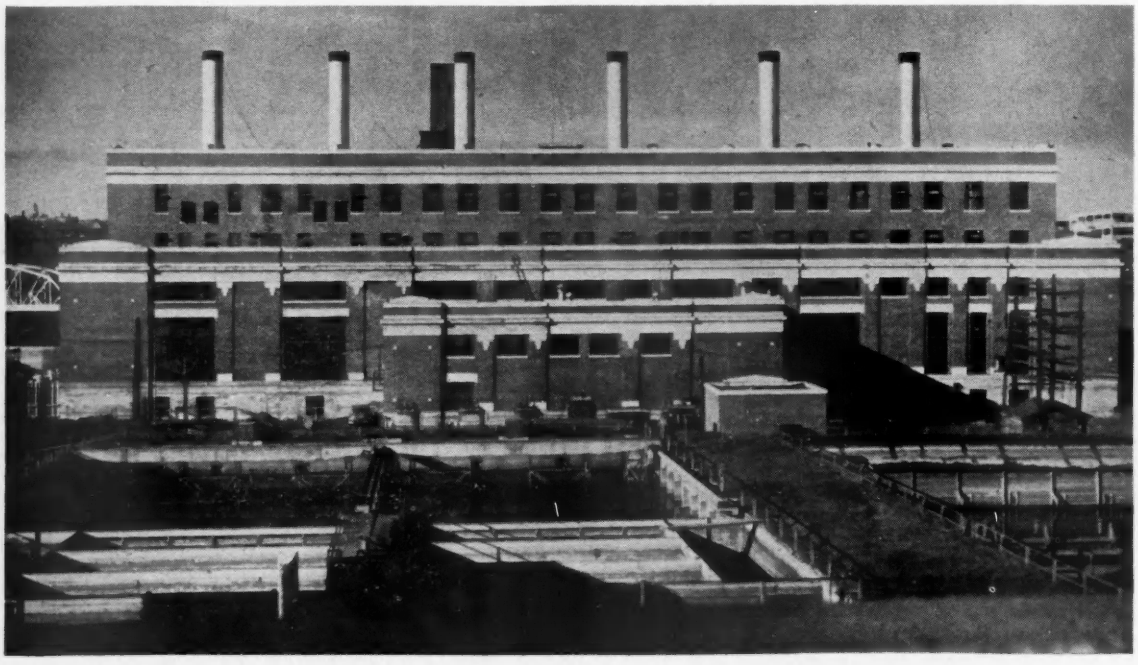
Subsequent extensions took place, and the installation of the new 30 MW generator, the second of its size in the plant, and the new gas boiler was started in 1951. Originally the first five boilers were coal fired, but studies showed gas to be competitive in price. Since 1950, three boilers have been converted to gas, resulting in a one-third increase in their steam output.

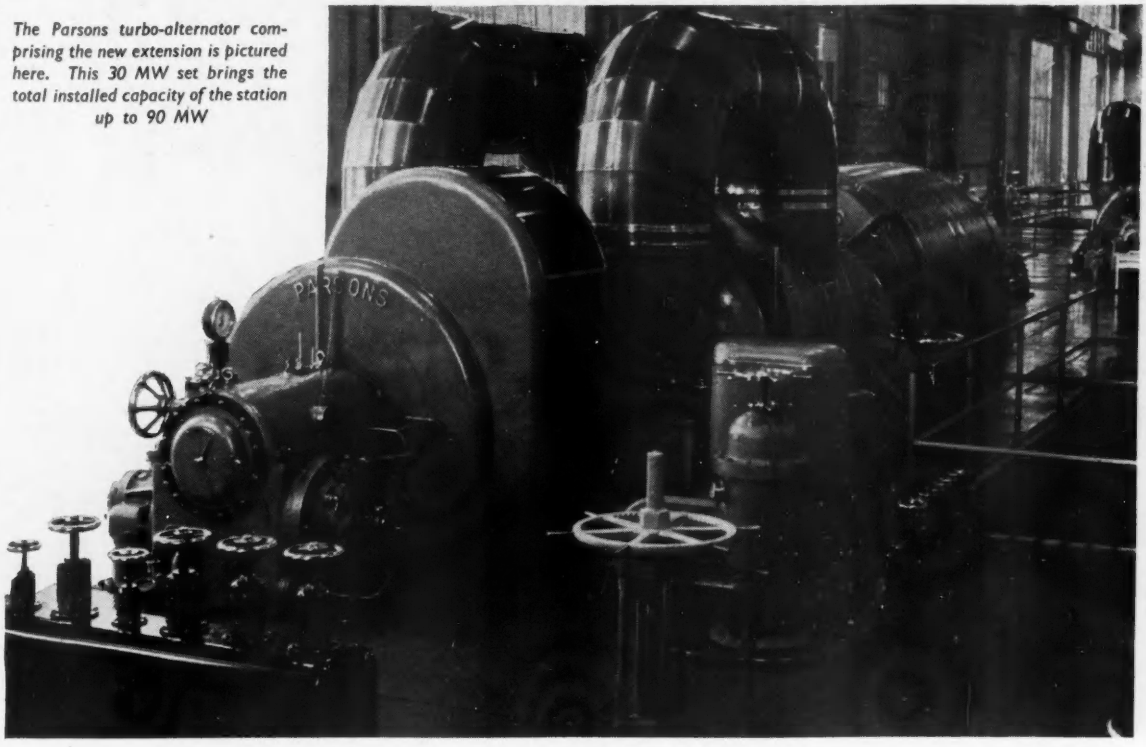
Construction of a further extension has been started at the south end of the plant, and this will raise the installed capacity from 90 to 120 MW. This is to cope with a load growth which has doubled in the past seven years, and is expected to require a capacity of 130 MW by 1960. The average long-term increase in load is about 8·8% but due to the oil development, present increases in peak load and units sold are averaging about 12% per annum.

Extension Details

The boiler was furnished and installed by Babcock and Wilcox and Goldie McCulloch Ltd., of Galt, Ontario. It is a B & W two-drum boiler with fully water-cooled furnace, pendant superheater and vertical tubular air-heater. Firing is by fourteen B & W forced-draught register type gas and oil burners, with gas as the normal fuel. The forced and induced draught fans are mounted on a single shaft with a motor drive through an hydraulic coupling. All controls were supplied by the Bailey Meter Co. and

In this external view the whole of the Edmonton power station is shown, including the extension referred to in the article





The Parsons turbo-alternator comprising the new extension is pictured here. This 30 MW set brings the total installed capacity of the station up to 90 MW

are tied in with the Plant Master Control. All pressure parts are built to a design pressure of 460 lb/sq in. Operating conditions are 415 lb/sq in. at 750° F at the superheater outlet, the feed water temperature being 260° F.

B & W cyclone steam separators, with collecting manifold, are fitted to the steam drum, together with dry pan and steam scrubber baffle, and beside the usual connections, the drum has also blow down and chemical feed nozzles. One of the two gauge glasses is equipped with a periscope, and there is an "Eye-Hye" indicator and also a Bailey water level recorder on the control board.

The fourteen 16½ in. combination gas and oil burners are arranged in three staggered rows, and each is equipped with a shut-off cock. The gas-pressure at the burners is 7·5 lb/sq in. Oil atomisers are of the "Y-jet" type and are supplied with saturated steam at 100 lb/sq in. Although the burner gas pressure is 7·5 lb/sq in., the main boiler supply header is fed with gas at 25 lb/sq in., and a Bailey control valve brings this pressure down to the operating value. Interlock valves are provided to shut off the gas supply to the burners in the event of a fan failure.

Boiler Auxiliaries

Combustion air is controlled by a duplex forced-induced draught system which comprises one Sturtevant Turbovane, single-width, single-inlet, induced draught fan with outlet louvre damper, and one Sturtevant Turbovane single-width, single-inlet, forced-draught fan with inlet vane control. These two units are driven through a Vulcan Sinclair fluid coupling by one 300 h.p., 900 r.p.m. induction motor.

A low-pressure and a high-pressure heater are provided to give a final feed temperature of 260° F. The surface condenser is rated at 238 klb/hr at a vacuum of 28·86 in. Hg, when supplied with 42,000 gallons/min of circulating water at 65° F. A 3-stage air ejection is provided with a capacity of 122 lb of air/hr. An evaporator is also incorporated in the bled-steam system and has a capacity of 5% of the total turbine steam requirements.

Made by C. A. Parsons and Co., Ltd., the turbine is a reaction machine with a high pressure cylinder and dual-flow exhaust. It is designed for 3,600 r.p.m. with stop-valve conditions of 390 lb/sq in., at 750° F. Erection of the plant was carried out by the power station staff, under the direction of one of Messrs Parsons' erectors. Coupled directly to the turbine is the 30 MW 0·8 p.f. 14 kV alternator with direct driven pilot and main exciters.

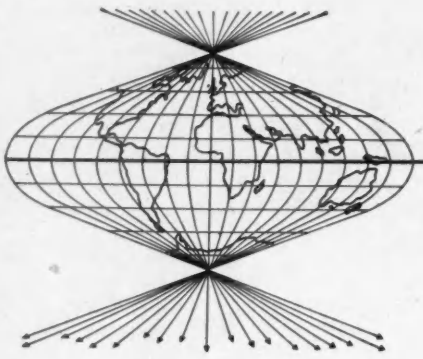
Rolling gear is provided for the set, together with the necessary high pressure jacking pump, and all other usual auxiliaries. Steam consumption at full load, including feed heating and steam for ancillary items is 9·381 lb/unit generated. Efficiency of the alternator is 96·4% on full load. Main and pilot exciter voltages are 250 and 110 respectively, and their corresponding output capacities are 81 and 10 kW.

Ventilation of the alternator is provided by two motor-driven fans in a closed system with two air coolers in the circuit. One of these coolers takes water from the condensate system and the other is fed from the c.w. system. An air temperature alarm is provided to give an audible signal in the event of an unusual rise in temperature, and the stator is provided with multi-point temperature indication at twelve significant points.

Circulating water for the unit, as for the other three units, is provided from the pumping station which was installed when the first 15 MW generator was put into operation. This pumping plant now has a capacity of 70,000 gallons/min. Provision has also been made to obtain water from the low lift pumps of the domestic water pumping plant.

The turbine and alternator are carried on a heavy concrete mat which is supported by wooden piles driven to an underlying gravel bed, and this arrangement provides a very stable foundation with consequently smooth operation.

All the design work for building, boiler and turbine foundations, piping, and ancillary equipment was carried out by the power plant staff.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Kitimat Progress

Such good progress is being made with construction work for the Kemano-Kitimat hydro-electric scheme for Aluminium of Canada Ltd., that the first set is expected to be in operation early in the summer, we understand. At this major power scheme in British Columbia, primarily intended for increased production of aluminium, the turbines are now being installed to provide 450,000 h.p., the first phase of an eventual 2,200,000 h.p. installed capacity. The smelter itself, being constructed at Kitimat, is nearing completion. In the first stage of the project, the annual production of aluminium ingot will be around 90,000 tons, but eventually 500,000 tons will be produced annually.

Company's Expansion

An increase of 12·2% in units sold by the Southern Canada Power Co. during the year ended 30 Sept. last, is shown in its latest report. Total unit sales amounted to 554·5 million. A further 53 miles of new distribution line were erected during the year, bringing the total to 2,936 miles. It is stated that electrification of the company's rural area is now about completed. The company has a useful sideline in the production of timber. Its Forestry Department has over 1¾ million hard and soft wood species thriving in 1,554 acres of plantations.

Acquisition in View

The Quebec Legislature has passed a Bill which paves the way for the purchase by the Quebec Hydro Electric Commission of the outstanding common and preferred shares of the Montreal Island Power Co. The Commission at present holds 8,622 of the 10,000 preferred shares and 68,582 of the 75,000 common shares of the Montreal company. The Bill involves purchase of stock at a price of about $170,000. The passing of the Bill followed a long series of disputes involving a number of companies which dates back to 1944 when the Montreal Light, Heat and Power Co. was expropriated. Urging the passing of the Bill, Premier Duplessis said the recommendation had come from a board of three competent authorities who had studied the expropriation and from the Quebec Hydro Electric Commission. He pointed out that non-settlement would mean long, expensive litigation which would have to be paid for by the expropriating party.

U.S.A.

Protest at Contract

A protest has been made by the General Electric of America against the award of the U.S. Army Corps of Engineers' contract for the supply of two 108,000 h.p. generators for the McNary Dam to the English Electric Co., Ltd. (which we noted on 24 Dec.). The English Electric Company's tender price was $3,651,476, compared with the General Electric's bid of $4,292,000. Mr. Crawford, vice-president and general manager of the latter's Electric Motor and Generator Division, has suggested that the contract should be reconsidered. It means that America would be deprived of more than $1,159,000 in taxation and the loss of a million man-hours of work, he said. While the British firm would pay £150,600 import duties, he estimates that Federal, State and local taxes resulting from the manufacture of the units by the American General Electric would more than offset the net gain of what would seem to result from acceptance of the low British bid. In his opinion, the ability of the British firm to quote lower than a U.S. company was due to the difference in wages paid in the two countries.

Appliance Industry's Good Year

The gloomy outlook predicted last January for the electrical appliance industry in the United States in 1953 has been proved wrong, it is stated. It is now estimated that the industry produced appliances to a total value of nearly $5,000 million. Of this sum, about three-quarters was accounted for by such apparatus as refrigerators, washing machines, cookers, air conditioners, vacuum cleaners and garbage disposal units. The industry was apparently greatly surprised at the household refrigerator market. Whereas dealers thought that the market was all but saturated a year ago, and production was kept at a low level, the demand began to appear again by the end of the first quarter, and the hot summer accelerated breakdown, and output had to be rapidly increased. By the end of the year over 3,200,000 refrigerators had been sold by stores, their retail value exceeding $900 million, it is estimated. But experts within the industry are again declaring that the refrigerator market is now more than 90% saturated.

BELGIUM

Railway Electrification

It has now been decided not to electrify the 1,500 km of main track of the Belgian railways after all. Some 670 km of line is to be electrified, and on the remainder diesel-electric locomotives will be utilised. The line from Brussels to Antwerp and Brussels to Charleroi are already electrically operated. The electrification project of the Brussels to Ostend line and Brussels to Liege is to be carried out in addition to similar work on the route towards Luxemburg-Basle as far as Namur. No decision has yet been reached concerning the 170 km of line between Namur and the Luxemburg frontier. The routes out of Brussels which are to be operated by diesel-electric locos are those running towards France via Mons, Tournai and Courtrai. This form of traction is also to be employed on many cross-country routes, including the Charleroi-Liege line, and the line running south to Athus. In this expansion, the Belgian electrical industry is co-operating, and it is expected that 100 locomotives will be produced annually, completing the capital phase of the diesel-electric programme by about the end of 1959.

ITALY

Gas Turbine for Italy

An order for an industrial gas turbine has been placed with Ruston and Hornsby Ltd. by an Italian firm, Societa Nazionale Metanodotti, which is concerned with the exploration, drilling and distribution of methane gas, large quantities of which have been discovered in that country. This organisation is having built new headquarters 15 km south of Milan in San Donato Milanese, which will house the administrative staff, stores,

repair shops, bottle filling stations, garages and research station. Adjacent to it S.N.A.M., as the concern is briefly known, are building blocks of flats and houses. From there, control and administration of the distribution of methane gas will be carried out via pipelines to industrial and domestic consumers all over the country. The Ruston machine, claimed to be the first industrial gas turbine to be installed in Italy, will drive an alternator to provide all the light and power for the offices, works and dwelling houses. The turbine, to run on methane gas, will also be provided with waste heat recovery plant to heat the buildings in winter. This will be done through a heat exchanger which will help to obtain the maximum efficiency from the plant for electric power during the summer, and allow partial space heating in that period, whilst in the winter months the fuel heating capacity will be taken from the exhaust gases of the turbine.

SOUTH AFRICA

Switch Manufacture

A new factory was recently put into operation at Durban by "Diamond H" Switches (South Africa) Ltd. for the manufacture of heater switches and other heat controls. Established to meet the increasing demand in the Union and also the desire of South African electric cooker manufacturers to purchase locally made switches, the enterprise has been carried out under the supervision of English engineers sent out by the parent company, "Diamond H" Switches Ltd. of Gunnersbury Ave, Chiswick, W.4. Already large quantities of switches have been delivered to most of the important cooker manufacturers in the Union. These switches are of an entirely new design, built on porcelain bases, designed to meet local requirements. All the press tools, jigs and fixtures were, in the initial stages, designed and manufactured in England, but the new company has since become responsible for the production of additional equipment of that type made in South Africa. Complete testing apparatus to S.A.B.S. standards has also been installed and all switches bear the approval mark. Various types of switch from the same basic design are being developed, and the production of new electric oven thermostats will probably commence this year. The English representatives on the board of directors are Mr C. A. Turner and Mr E. J. Harris, and the company is being operated in the Union by E. S. Mowat and Sons (Pty.), Ltd., who have represented "Diamond H" interests for many years.

Transformer Contract

After much deliberation the Cape Town City Council has now placed an order with the Brush Electrical Engineering Co., Ltd., for two 30,000 kVA power transformers at a total price of £60,480. We reported last October that the City Council's Electricity Committee had received 27 tenders for the supply of the transformers, the lowest being that of A.E.G. of Western Germany at £43,920, and the highest, that of the General Electric of America at £103,282. At that time the Committee decided to postpone a decision on the matter in order to obtain further information in view of a reminder by the consulting engineers that "continental transformers were in general inferior in design and construction to those of British manufacture." The Brush Co.'s quotation, which has now been accepted, was the ninth from the lowest.

INDIA

Duty on Wires and Cables

The Pakistan Government was urged to assess import duty on wires and cables on the c.i.f. value instead of on market value by Mr Zahir Ahmad Rizvi, president of the Pakistan Electrical Merchants' Association when speaking at the annual general meeting of the Association a few days ago. He maintained that the present method of assessing duty on cable was causing great hardship to dealers and delay in clearing consignments. He said that in the period July-Dec., 1952, electrical goods worth Rs. 25 million were imported, while during the current year goods worth not more than Rs. 75 lakhs had been imported. Although local manufacture had to some extent helped in meeting the demand, the shortage of raw materials and dearth of technicians were great obstacles to which the Government and industrialists must give due consideration.

Mission from Burma

An Electricity Supply Mission from Burma is now in India studying hydro-electric projects and other industrial matters there. The mission is headed by U Ba Sein, chairman of the Burma Electricity Supply Board, the other members being U Tun Ohn, chief electrical engineer, and U Aye, hydro-electric engineer. Apart from visiting such projects as the Damodar Valley Scheme, the mission, while in Delhi, is negotiating with the Government for the recruitment of electrical, mechanical and civil engineers from India for service with the Electricity Supply Board, Burma.

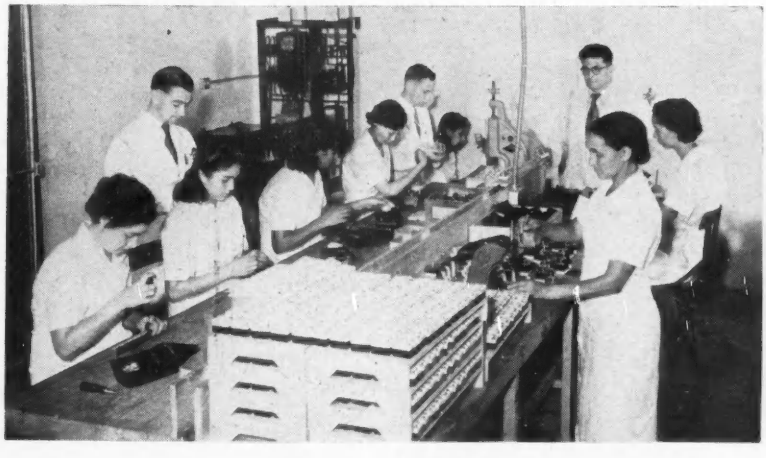
AUSTRALIA

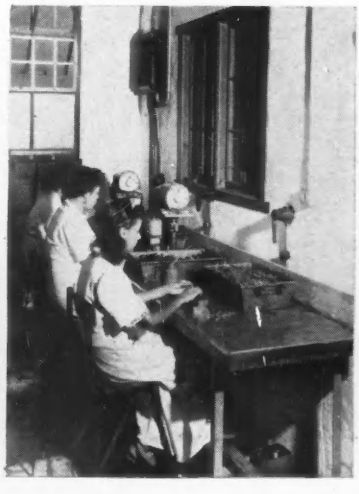
Change to Oil Burning?

A move which may result in the Electricity Trust of South Australia burning oil instead of coal at Osborne power station has been announced by Mr R. H. M. Lea, chief engineer and general manager of the Trust.

He revealed that tenders were being called for supply and installation of plant at Osborne B power station to convert six existing boilers to oil-burning. He said the Trust was seeking to find out whether it was cheaper to burn oil than coal. At this stage the Trust was calling tenders to find out the capital cost of conversion which would then be allied with cost of the fuel and compared with costs of burning coal. Five of the eight boilers at Osborne B plan were adapted to burn Leigh Creek coal, the others burning Newcastle black coal. The tenders include supply of equipment to pump the oil from a 7,000-gallon tank to the boilers and for conversion of four other boilers now on order for the plant and to be commissioned in 1956-7.

Below, switch assembly work; right, manufacture of the parts at the Durban factory





Personalities IN THE INDUSTRY

Ald W. S. Lewis, C.B.E., J.P., COMP.I.E.E., chairman of the Midland Electricity Board, is to retire from the Birmingham City Council of which he has been a member for 27 years, because of pressure of work arising from his position. Ald Lewis was a war-time Lord Mayor of Birmingham. When attending his last meeting of the City Council last week, tributes were paid to him by the Lord Mayor, Ald G. H. W. Griffith, and by Ald J. C. Burman and Ald A. F. Bradbeer. It was decided unanimously to record on the minutes the Council's appreciation of Ald Lewis's long service to the city.

Lancashire Dynamo Electronic Products Ltd. announce that **Mr R. J. F. Howard,** chief engineer, and **Mr S. Burr,** works manager, have joined the board of the company.

George Ellison Ltd. announce a number of changes in their staff. **Mr J. G. Fraser,** C.A., has been appointed Secretary to George Ellison Ltd. and associated companies—Tufnol Ltd. and Alfred Ellison Ltd.—in succession to **Mr R. Sawyer,** who retires after 42 years' service. **Mr J. R. T. White** has been appointed manager of the London area sales office of George Ellison Ltd., succeeding **Mr E. P. Lucking,** M.I.E.E., who also retires after 42 years' service. Mr Lucking was originally a development engineer for switchgear and motor starters with Adams Manufacturing Co. (now Igranic Electric) and later the General Electric Co. He joined George Ellison in 1912 and in 1930 became manager of the London area sales office. He is to remain with the company in an advisory capacity. Mr White received early training with the English Electric Co. and later joined the Switchgear technical staff of Johnson and Phillips. In 1945 he took up an appointment on the electrical staff of the oil mills group of Unilever Ltd., and ultimately was promoted to chief electrical engineer of the firm's U.K. oil mills. He joined George Ellison Ltd. in 1950 as deputy to Mr Lucking. The new secretary, Mr Fraser, has served with Thomson McLintock and Co., and a subsidiary company of Tube Investments Ltd. before becoming secretary of Associated London Properties Ltd.

Mr F. A. Fawcett, B.ENG., A.M.I.E.E., has been appointed sales and commercial manager of David Bridge and Co., engineers, of Castleton, Rochdale, and will be joining the board in the near future, we understand. He was previously with the Metropolitan-Vickers Electrical Co., Ltd., for 29 years in its Marine and Special Contracts Department.

Bakelite Ltd. announce the following executive staff changes, necessitated by the continued expansion of the company: **Mr A. Lloyd,** who was previously joint manager, Thermosetting Division, and works manager at the company's works at Tyseley, now becomes general works manager; **Mr G. J. Taylor,** previously joint manager of Thermosetting Division, and Thermosetting Division sales manager, is appointed manager of the Thermosetting Division; **Mr P. Smith,** who was formerly sales manager, Laminated Materials, is now designated sales manager, Thermosetting Division; **Mr C. E. Tofts,** previously assistant to Mr P. Smith, becomes sales manager, Laminated Materials; **Mr R. Hulse,** until recently manager, Moulding Material production at Tyseley, is promoted to works manager, Tyseley; and **Mr A. Tonks,** who was previously Works Technical Dept. is now manager, Moulding Material production at Tyseley.

The B.B.C. has appointed **Mr A. I. Bray,** B.SC.(ENG.), A.M.I.E.E., A.C.G.I., as engineer-in-charge, Television Outside Broadcasts (London). Mr Bray joined the engineering staff of the B.B.C. in 1935 and was attached to the London Outside Broadcasts section. He transferred to Television Outside Broadcasts in 1936. After war service in the R.A.F., he rejoined the B.B.C. early in 1946 in the Planning and Installation Department, but he returned to Television Outside Broadcasts later in the same year, where he remained and held a number of senior posts in the London section until taking up his present appointment.

Mr J. B. Scott, sales director of Crompton Parkinson Ltd., last week gave a dinner party for **Mr Sidney Auger** and presented him with a cheque on his retirement at the age of 73 after 53 years' service with the company. Mr Auger was for many years Home Counties sales manager and a specialist engineer in cement and paper manufacture. Tribute was also paid to the loyal service of Mr Auger by **Mr T. H. Windibank,** a director of the company.

Mr Auger receives the presentation

The National Gas and Oil Engine Co., Ltd. has appointed **Mr F. D. Langley** as sales manager, and **Mr W. L. Beckett** as London area sales manager. Mr Langley, who also becomes a director of National Oil Engines (Export), Ltd., first became associated with the company in 1922, and has subsequently gained extensive experience overseas. Latterly, he was resident engineer responsible for the installation of the Colne Valley dual fuel power station, on the completion of which he was appointed National's London manager, relinquishing that post in 1952 to become manager of the newly formed petroleum division of the Brush group. Mr Langley will retain that position in addition to his new appointment. The National company also announce that **Mr J. A. Barker** becomes commercial manager at head office, Wellington Works, Ashton-under-Lyne, in charge of the commercial department.

Mr J. R. T. White

Mr E. P. Lucking

Mr J. G. Fraser

Just appointed director of the Telecommunications Engineering and Manufacturing Association is **Mr H. Faulkner,** C.M.G., B.SC., M.I.E.E., F.I.R.E., who retired last week from the position of deputy engineer-in-chief to the Post Office after a life-long connection with telecommunications. Born in Nottingham, Mr Faulkner studied at the University College there, and entered the G.P.O. through the Assistant Engineers' Open Competition. After service with the R.E. Signals during the first world war, he was actively engaged in the establishment of the Rugby Radio Station. He had experience both at Headquarters and in the field as superintending engineer in North Wales and deputy regional director. He was appointed assistant engineer-in-chief of the G.P.O. in 1947. Mr. Faulkner has been chairman of the South Midland Centre of the I.E.E. and was until recently a member of the Council.

Mr H. Cobden Turner, J.P., A.M.C.T., M.INST.C.E., M.I.E.E., M.I.MECH.E., managing director of Salford Electrical Instruments Ltd., has been elected chairman of the North-West region of the Engineering Industries' Association for a further term.

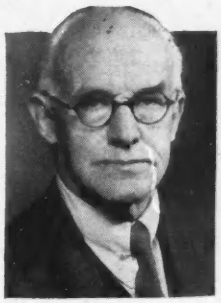
Formerly chief lighting engineer with the Courtaulds group, **Mr R. C. Pennington** has joined Harris and Sheldon (Electrical) Ltd.

Two employees of The Micanite and Insulators Co., Ltd., have recently completed fifty years' continuous service with the company. They are **Miss Harriet Fletcher** who retired at the end of last year, and **Mr Arthur Bull** who has seen service in every department of the Works and is still actively engaged as foreman of the Paxolin Board Department, as well as paper varnishing and varnish manufacture.

We offer our congratulations to **Mr G. F. N. Oliver,** managing director of Oliver Pell Control Ltd., and a director of Varley Dry Accumulators Ltd., who was recently married to Miss Anne Vachell, of Cleeve, Somerset. Our accompanying photograph, taken at the reception, shows the bride cutting the cake, assisted by Mr Oliver.

Mr Oliver and his bride cut the cake

Mr H. Faulkner



Mr E. Leete

Mr I. Shoenberg

Due to retire in May next, **Mr J. J. Cargill,** B.SC., M.I.E.E., chief electrical and mechanical engineer to the North of Scotland Hydro-Electric Board, has intimated that he does not wish to continue in his present post beyond that date, but he has agreed, at the Board's request, to continue to give his services in connection with the Peat Development Scheme and windpower, and to act in an advisory capacity on other matters. His successor as chief electrical and mechanical engineer is to be **Mr C. L. C. Allan,** B.A., A.M.I.E.E. Mr Cargill started his career with the Dundee Corporation Electricity Department, and then served for many years the Scottish Power group first as station superintendent at Bonnybridge power station, later as assistant to the general manager of the Scottish Power Co., and ultimately as manager of the Grampian Electricity Supply Co., Ltd. In connection with the Peat Development Scheme, Mr Cargill continues as chairman of the Technical Sub-Committee of the Peat Development Committee. Born in Edinburgh, Mr Allan has served with the Board for about nine years. He is at present chief assistant to Mr Cargill. Before joining the Board he was successively with Balfour, Beatty and Co., Ltd., the Central Electricity Board, and Ipswich Corporation's Electricity Department. He served his apprenticeship with Bruce Peebles and Co.

Long service awards were recently presented to many members of the staff of the South Staffordshire and North Worcestershire Sub-area of the Midlands Electricity Board. The presentations, the first to be made in the sub-area since nationalisation of the industry, were made by **Alderman W. S. Lewis,** chairman of the Board. Recipients of the awards included: **Mr T. G. Keeler,** the sub-area manager, who received a silver cigarette box in acknowledgement of 40 years' service; **Mr A. E. Price,** the sub-area engineer, with 29 years' service; **Mr D. Layton,** the sub-area purchasing officer (41 years); **Mr F. G. Haddon,** district manager at Oldbury (25 years); **Mr G. S. Fisher,** district manager at Smethwick (28 years); and **Mr S. Raybould,** district manager at Wednesbury (30 years). There were also two former district managers, **Mr R. P. Jones,** of Halesowen, who retired in September after 40 years' service, and **Mr E. J. Smith,** formerly of Wednesbury, now in the planning and operations department at sub-area headquarters, with 46 years' service. **Mr E. Griffiths,** who recently retired as district engineer at Wednesbury, received an award for his 45 years' service.

At last Thursday's meeting the Council of the I.E.E. elected **Mr Ernest Leete** to honorary membership of the Institution for his outstanding services to the I.E.E., particularly as honorary treasurer, as a member of the Council, and for his work on behalf of the Benevolent Fund. The Council also awarded its Faraday Medal to **Mr Isaac Shoenberg** for his distinguished work in electrical engineering, in particular the outstanding contributions which he has made to the development of high definition television in this country. Mr Leete has served on three separate occasions the full three years' period as honorary treasurer of the I.E.E. His interest in the activities of the Benevolent Fund have extended over some 20 years or more, during ten of which, except for short periods, he was deputy chairman of the Court of Governors. Born at Wallington and educated at Uppingham, he joined the London Electric Wire Co. and Smiths Ltd. in 1904, became secretary in 1906, director and secretary in 1912, and was joint managing director from 1916 to 1935. Since then he has been a director and consultant with the company. Mr Shoenberg, a director of Electric and Musical Industries Ltd., led the team of scientists at E.M.I. which developed the television system and its ancillary equipment which was adopted by the B.B.C. in 1936. The great success of the television Coronation programme last year was to a considerable extent the result of Mr Shoenberg's pioneering work, and it was with this in mind that the Council of the I.E.E. decided that it would be appropriate while thoughts of the Coronation were still fresh to award Mr Shoenberg the Faraday Medal.

Mr Victor Watlington, M.B.E., A.C.G.I., M.I.E.E., and **Mr T. W. Heather,** M.C., have been re-elected for the ninth year in succession to act in their respective capacities of chairman and vice-chairman of the Electrical Fair Trading Council. Mr Watlington will also be remembered in connection with his long association of B.E.A.M.A., while Mr Heather has been director and sales manager of the General Electric Co. for about 20 years.

Appointments being made by the Appleby-Frodingham Steel Co., are announced. As from 1 April next **Mr K. Paterson,** director and chief engineer of the company, will take up the appointment of general manager of the United Steel Structural Co., of which company **Mr H. Saunders** will be commercial manager and director. **Mr L. Gaskell,** A.M.I.E.E., at present chief electrical engineer of Appleby-Frodingham Steel Co., will become chief engineer to succeed Mr Paterson; **Mr W. E. Smith** is being promoted to chief electrical engineer, and **Mr D. R. M. Nisbet** will then become deputy chief electrical engineer.

Tube Investments Ltd. announces the appointment of **Major-General R. F. Belchem,** C.B., C.B.E., D.S.O., for special duties as a member of the personal staff of the chairman, **Mr Ivan Stedeford.**

In pursuance of their policy of seriously developing their markets abroad, Smith Meters Ltd. have this week sent **Mr C. H. West,** the area sales manager for the Eastern half of England, to the Caribbean and South America. He will be away until about 17 May, and during that time will visit the West Indies, Venezuela, Dominican Republic, Cuba, Mexico, Guatemala, Nicaragua, Costa Rica, Colombia, Ecuador, Peru, Bolivia, Paraguay, Chile, Argentine and Uruguay.

We now have more news concerning **Mr W. Marter Furniss** whose resignation from the Board of the Electric Construction Co., Ltd., at the age of 88, we briefly noted last week. In the 1890's he was engaged in the development of electricity supplies in Ireland, especially in Carlowtown, Bray (Co. Wicklow) and Larne. The first generating plant for the Carlow undertaking was a 2,800 V alternator made by the company which was then known as the Electric Construction Corporation Ltd. Later he was associated with the very early days of the application of electricity to coal mining, particularly in South Wales. He joined the Electric Construction Co., Ltd. in October, 1902, as sales engineer and, as we stated last week, ultimately rose to chairman and managing director. The board of directors have now appointed as chairman **Mr Charles Reid,** D.S.O., M.A., C.A., who has been associated with the company for 35 years, originally as a partner of the company's auditors and, since 1944, as a director of the company. In addition, **Mr W. M. B. Furniss** has been appointed managing director. He joined the company in 1925 as an indentured apprentice, and has successively held the positions of special plant estimator, sales engineer, assistant manager, general manager, director and assistant managing director.

Mr M. T. J. Goff and **Mr H. Mathews** have been elected directors of Crofts Engineers (Holdings) Ltd.

Mr W. R. Warren, youth training assistant at the North Western Divisional headquarters of the B.E.A., has been appointed education and training officer to the Midlands Division, B.E.A.

NEW LITERATURE

Natural and Synthetic Fibres

ONE of a series of surveys of industrial raw materials, this booklet has been compiled by various authors primarily for students taking the education course of qualification for the Purchasing Officers Association. Despite this apparent limitation, the book provides useful information for those studying world sources of supply of industrial materials, and has a particular appeal to the electrical engineer in those chapters dealing with materials used for electrical insulation. Seven materials are studied in the book, being categorised as either natural or synthetic. In the former transients—are studied in the penulteniali esporto, flax, jute and sisal and manila are dealt with, each chapter dealing briefly with its location, method of production, volume of output and end usage. The synthetic fibres of glass, nylon and rayon are dealt with on a similar basis. Published by the Purchasing Officers Association, Woodrobe Court, 146A Queen Victoria St, E.C.4, 39 pages, 8¼ in. by 5⅛ in. Price 3s. 6d.

Control of Electric Motors

by P. B. Harwood

AS the application of electricity in industry expands, so does the range of control gear in common use for electric motors extend and become more complex. It is understandable, then, that a book attempting anything approaching a complete coverage of the subject shall be bulky and, unfortunately, rather costly. Yet this third edition of what is now a well-established American handbook on the subject is better value for the money for British engineers than are many companion volumes: the essentials of the subject are the same on both sides of the Atlantic, and some U.S. ideas are finding growing application here.

The early part of the book is given to a description of the construction of control panels, and of various kinds of d.c. contactors. This is the most specifically American section of the book, in most other parts the country of origin is not clearly apparent. The descriptions are essentially practical in basis, directed to designers rather than users, and minor details as well as major components are fully described. Later in the book there are descriptions of automatic accelerating systems and of other control schemes applicable to d.c. motors. A.C. contactors and relays are then considered, followed by the various types of a.c. motor. In these chapters the motor and its characteristics are first described and analysed, and various special methods of starting and control are then set out. The volume ends with chapters on magnetically-operated brakes and on resistor design.

Throughout the book the account is on clear and uncomplicated explanation, with ample illustration. It should prove most helpful to students and engineers interested in motor control. Published by Chapman and Hall, 538 pages, 9 in. by 6 in. Third edition, price 60s.

The Exporter's Year Book

WITH the continued urge to export more, it is essential that manufacturers and others concerned should maintain up-to-date information relating to overseas markets. To meet that need is the aim of this valuable year book. It provides all those essential details such as regulations regarding packing, the sending of samples, certificates of origin required, and much other commercial information applicable to all countries throughout the world. Regular users of the year book will find that the presentation of data in this 1954 edition follows that of its predecessors, but, of course, the particulars have been brought up to date. 350 pages, 9¼ in. x 7 in. Published by Siren and Shipping Ltd. Price 40s.

Electric Trains and Locomotives

by B. K. Cooper.

ALTHOUGH railway electrification has had a long and creditable history in this country, it has—excepting the Southern Region system—not made any substantial progress. Yet the contribution which can be made by main line electrification has been recognised and appreciated by senior railway officials, and many schemes have been worked out in detail and then shelved, mainly on the grounds of capital expense, or lack of available labour and materials. The situation is, however, fast arriving when railway electrification will become a necessity if freight charges are to be held stable and if the railways are to regain the traffic now being lost to road haulage.

For these reasons, Mr B. K. Cooper's book has come at an opportune time, describing as it does, modern developments in this field both at home and abroad. Although many volumes have been written on electric locomotives, this must be among the most comprehensive in scope and yet it is not so technically advanced that the average reader will find himself discouraged by large circuit diagrams or mathematical analyses. To all railway enthusiasts, who have not already succumbed to the lamentable fascination of steam locomotives, this book is a "must." Published by Leonard Hill Ltd., 9 Eden St, N.W.1. 111 pp. 8½ in. x 5¼ in. Price 15s.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell, why not tell yours on this page. We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Factory Installations

MUCH thought has been given to the sizing of cables and switches to suit any particular proposed installation. It is possible, of course, to calculate the most immediately economical distribution, and, over a period of years, if there is little or no development, this will prove to be a most successful method.

Fortunately, for progress, in many factories this is not the case, and within a few years switches are heating and cables are warm to the touch. Additional cables are run, and switchgear is tacked on to the original board. Textbook methods of planning have failed to meet the need.

It is impossible, of course, to foretell accurately the demands of future years, and the financial aspect may govern the position so rigidly that the engineer must cut his cloth with little to spare. Generally, however, he is to blame for not stating his claims effectively. There are few directors who will not move at least part of the way when advised by a competent engineer.

If an organisation is virile, and there is a possibility of expansion, it is a hundred to one on that in a few years' time the installation will be hopelessly inadequate. At this stage alteration is costly and troublesome.

The writer is making a plea for very serious thought in the initial planning. Suppose the "powers that be" were warned that the initial set-up must not be changed for ten years would they be so easily satisfied as many are today? Isn't the thought often, "Oh, we can always expand the electrical lay-out quickly; we'll concentrate on production equipment or wall surfaces."

Let's take a case in the writer's experience. A three-hundred amp main breaker had been fitted. It was controlling an installation of a maximum possible load of 280 amps. The business was very much alive and the market for the goods produced was expanding. The industry was also rapidly becoming mechanised.

In three years' time the breaker was stepped-up to 600 amps and the original one scrapped. Apart from the switch main cables had to be increased in size. Now, intelligent anticipation would have taken care of the capacity of the breaker and cables, provided the business with a switchboard of the readily expanded type and ensured that the main switch room was capable of housing sufficient gear for all foreseeable extensions.

On the other hand a reckless overestimating of future needs is equally deplorable, but the opposite is normally the case. The writer would recommend that, after the existing plant is provided for on paper these questions be asked:

Is this business likely to grow?

If so will it be likely to expand using the existing building? Can this building be extended?

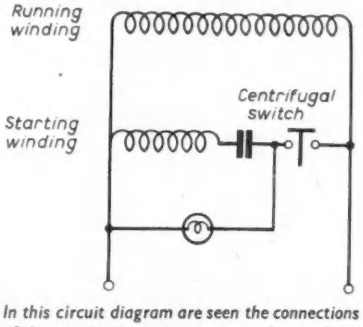
Are the production processes becoming increasingly mechanised?

Is it possible that electric heating will be utilised to a greater extent? (Watch for "back door" developments in this field. If one boiler becomes 950 seconds oil fired the electrical load will probably increase by about 20 kW including storage tank heating.)

Of course all competent contractors, plant and consulting engineers are well aware of the foregoing, but short-sightedness still flourishes.—*W. H. A.*

Centrifugal Switches

ACCORDING to my experience of 25 years most of the causes of the troubles in split-phase motors can be traced to the faulty operation of the centrifugal switch. In many cases this is not detected before the damage is done and the result is a costly rewinding of the split-phase or even the whole motor.



In this circuit diagram are seen the connections of the pilot lamp to give warning of centrifugal switch failure

To remedy this I would suggest the installation of a pilot lamp to operate as long as the centrifugal switch is closed. If for any reason the switch would fail to open when the motor attains the required speed, the lamp would draw attention to this fact.

In many applications of this lamp (in the form of, say, a glow bulb) it could be incorporated in the design of domestic appliances, such as washing machines, refrigerators, etc. However, its real *raison d'être* would be in the field of industry, where split-phase motors abound and the negligible cost of installation would save many a pound.—*C. J. Gluck.*

Misleading Name-plates

ONE fact emerges from the experience of your correspondent, C. Byrne, which is significant, namely—"This motor, of Continental Origin." With Continental manufacturers, unless the specification of the purchaser requires compliance with the appropriate British Standard, name-plate information may be unused to British engineers. Star/delta 380 V, whether in a Continental language or in symbols, invariably refers, as far as Continental manufacture is concerned, to the fuller detail also used, namely, star/380, delta/220 V. Star/delta 220 V is another form, the fuller information being star/220, delta 125 V.

We are apt, in this country, to associate all three-phase public supplies with line voltages in the order of 380-415, but three-phase 220 V is quite common in Continental countries. I remember in Belgium wishing to obtain some electric lamps for a row of country cottages, and going into the first cottage and finding the existing lamps 220 V and working correctly. Imagine my surprise to find that the next cottages when fitted with new lamps were receiving only 125 V.

The overhead three-phase four-wire supply was 220/125 V and some cottages were connected between line and neutral, and others between lines. In the case of the 220 volt two-wire connection, both poles of the supply were live but at only 125 V between any live pole and earth. Thus single pole switches which were used extensively were always in the live side of the supply, but the fittings also had their own live side.—*R. W. Marsh.*

Reliability at 15 Watts

IT has been the experience of the writer that 15 watt (230/40 V) b.c. general service lamps have comparatively short life—approximately ⅓ the total life of 40 and 100 watt lamps. (Perhaps an authority might care to comment.) With the foregoing in mind, the writer, on one occasion, was asked to devise a more reliable source of light of some 15 watts output. Located in an almost inaccessible position, the installation was required to "work" for up to 12 hours each day, seven days a week.

This was achieved by using one 25 watt, 240 V lamp and one 40 watt, 240 V lamp in series in the circuit, which at 240 V pressure produces approximately 16 watts light output. This application, to date, has done 8,000 hours work—far exceeding the average life of a single 15 watt lamp.—*H. R. G. Holloway.*

Equipment for Industry

Overload Relay for Motors

FOR use in control gear protecting motors driving high inertia loads, an overload relay of the oil dash-pot type has been recently introduced by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2. Developed at their Witton laboratories, the unit is designed to carry the prolonged starting current of such motors without risk of premature tripping or detracting from the normal overload protection. Variation in operating times from instantaneous to 40 seconds at 10 times f.l.c. is stated to be possible.

Component parts of the relay are reproduced below in which is shown (A) trip coil, and (B) operating plunger assemblies, (C) screwed adaptor sleeve and (D) oil dash-pot. To assemble the unit, the plunger stem and its iron thimble is inserted in the trip coil. The adaptor sleeve is then screwed up into the bracket arm at the coil base, the dash-pot being then screwed into the sleeve. Both components are fitted with locking nuts to position them as required.

As the plunger assembly rests on a collar with the adaptor sleeve, adjustment of the latter moves the iron thimble in relation to the trip coil and hence alters the overload setting. A small scale indicates 100 and 125% of full load operating positions.

Variation of the operating time is given by adjusting the dash-pot. When this is screwed fully up into the adaptor, the piston is wholly immersed in oil, which in combination with the bore restriction at the base of the pot, introduces the maximum delay in operation. Unscrewing the dash-pot lowers it until eventually the piston is completely clear of the oil, at which point operation becomes instantaneous.

The unit has an inherent delay, however, due to saturation of the iron thimble when the current exceeds a given value. Magnetic attraction thus ceases to increase rapidly with current rise, effectively delaying further the tripping operation. Moreover, the plunger stem and piston are constructed from duralumin to minimise weight and avoid the possibility of the assembly hovering in a mid-way position.

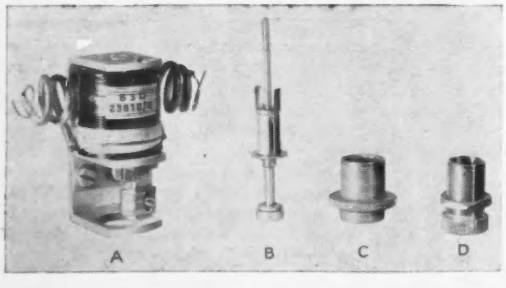
"PumPak" Pumping Set

DIFFICULTIES in replacing the stator in case of electrical breakdown is often felt to be one of the main objections to the application of a close-coupled electric pumping unit. In the "PumPak," introduced last week by Sigmund Pumps Ltd., Team Valley, Gateshead 11, the design provides a simple means of overcoming this difficulty.

Externally, this pumping set appears little different from most close-coupled electric motor driven, centrifugal pumps. The stator housing, however, is designed so that it can be taken apart at its centre and thus withdrawn complete with stator without disturbing the pump in any way. After disconnecting the leads at the motor terminals, the stator unit may then be despatched to the manufacturers, and a replacement stator obtained to minimise delay. Another feature of the unit is to be seen in the arrangements for cooling. A fan, mounted on the pump side of the stator, draws air in through the motor from a screened vent at its far side. A stream of this air is circulated round the pump side bearing for cooling, the air pressure across the bearing preventing the entry of any liquid into the bearing housing.

Sigmund's "PumPak" pumping set

Initially, the range of "PumPak" units now in production varies in motor size from 1½ h.p. to 15 h.p. at both 1,450 and 2,900 r.p.m. Capacities up to 500 gall/min. and heads up to 175 ft are available. An additional series of fan cooled and small units is shortly to be introduced.

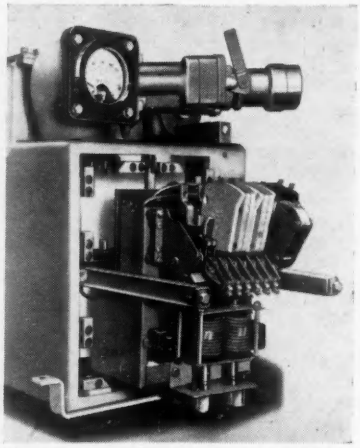


Here are seen the components of the G.E.C. relay

Mining Contactor Unit

A NEW addition to Type MU flameproof mining equipment is seen in the 80 amp mining contactor unit (gate-end box), Type MCV 82, recently introduced by the Metropolitan-Vickers Electrical Co., Ltd., Mosley Rd, Trafford Park, Manchester 17. Designed to the National Coal Board's Standard Specification No. P.3/1950, it can be applied to the direct-on-line starting of up to 60 h.p. squirrel cage motors, driving coal cutters, conveyors, loaders and similar equipment. As such it can be coupled to N.C.B. standard units or other equipment in the MU range.

Complete with skid arrangement, the unit is contained in a welded enclosure divided into two flameproof compartments. In the upper part is housed a set of three-phase, 300 amp bus-bars, and a t.p. reversing isolator, electrically interlocked with the contactor. The lower compartment contains the t.p., a.c. operated 80 amp contactor fitted with an arc splitter on each pole together with a d.p., magnetic pattern, o.l. relay adjustable over a wide range of current values.



The contactor unit is shown here with the main panel drawn out on its slide rails

Apart from undervoltage and overload protection, the unit provides earth-fault protection with an intrinsically safe electrical lock-out system, and intrinsically-safe remote control with earth-continuity and pilot/earth core protection. Earth fault protection is provided by a ring-type core-balance transformer whose secondary winding is connected to an earth fault relay open circuiting the pilot control circuit and energising a signal lamp with a fault to earth. This relay is energised by a circuit embracing the earth fault, thus forming an electrical lock-out which can only be released when the earth fault is removed. The lock-out circuit, supplied at 25 volts from a v.t. in the lower compartment, will take effect when the contactor is not in use, thus preventing its closing on to a fault.

The Washer with everything

NOTHING appears to have been overlooked in the design of the new "Servis" washing machine introduced this week by WILKINS AND MITCHELL, LTD., Darlaston, Staffs.

"Turbo-action" is the secret of its washing success. The 10 in. diameter Turbulator offset at the bottom of the container creates a strong vortex swirl of hot water throughout the whole of the 10 gallon tub taking 6 lb. of washing.

Under this "turbulator" the heating element—a special designed immersion element is housed so that the new model is a combined washing machine/wash boiler yet it will be retailed at 36 guineas plus £12. 3s. 9d. purchase tax making a total of £49. 19s. 9d.

A neat yet ample sized hand-operated wringer is fitted at the top of the machine. It has a most important property. It is "ambi-dextrous," i.e., by merely removing four retaining screws the wringer can be reversed for a left-handed person.

The new model is also self-emptying by an ingenious built-in centrifugal pump action. The housewife merely hangs the hooked end of the hose over the sink and moves the pump control to the "on" position and the machine empties itself.

The outer casing is well styled, is finished in white with chromium plating, red reliefs, a ½ in. black rubber trim at the waist to protect it and neighbouring furniture against knocks, and measures overall 32 in. high by 20 in. deep by 18 in. wide. A flat topped cover, the "Lid-Tray," which does duty as a clothes basket for wringing and carrying clothes can be hooked on to the side for wringing. Castors are fitted at the rear of the machine and a recessed lifting grip at the front so that it can easily be lifted and wheeled about without effort.

Controls are all centralised on a front panel—motor and heater switches and pump lever—whilst the power cable stows neatly on to the lid tray brackets.

This stylish newcomer is both washing machine and washboiler yet will retail at under £50

Mazda Hanging Sign

A NEW version of the Mazda "Dancing Girl" sign has been produced by the BRITISH THOMSON HOUSTON CO., LTD., Crown House, Aldwych. W.C.2.

It comprises a double sided hanging panel coloured in red, black and white on a background of green.

The sign can be supplied with a lighting canopy housing two 2 ft fluorescent lamps behind louvreing. This canopy is finished white internally and green externally to conform with the general colour scheme. Dimensions of the sign without the canopy are 23 in. long by 17 in. high.

Red, white and green are the principal colours in this new sign

Cables which coil themselves

RETRACTABLE power and instrument cables which coil themselves neatly are surely the answer to problems involved in the installation of communication equipment and portable appliances.

AERIALITE LTD., Castle Works, Stalybridge, Cheshire, market these flexible retractable cables, which are non kink and proof against damage by twisting. In the instrument cords the flexible copper "tinsel" conductors are covered with colour coded rubber insulation and the outer rubber sheath provides a tough yet resilient protection. Two, three and four core types are available and other types can be manufactured to lengths as required. Ratio of expanded/contracted lengths is approximately 3·75 to 1. Cords are supplied complete with connection terminals at each end.

The retractable power cables have conductors of 14/·0076 tinned copper giving an adequate power rating of 2 amps for use on 250 V circuits. The conductors are covered in rubber insulation and colour coded and two or three core types are available.

"Conquest" by Elga

BRINGING first quality appliances even into the most modest home is part of the policy of ELGA PRODUCTS LTD., Railway Place, Wimbledon, S.W.19, who have just introduced their "Conquest" kettle.

This new 4-pt 1,500 W model can be had in heavy gauge copper chromium plated or in aluminium. Three heat resisting insulating feet, a metal reinforced plastic handle plus non-drip fast-pouring spout and large lid are special features of this new model.

With an immersion type element and protected by safety cutout for a.c./d.c. supplies the Elga Conquest in copper chrome is priced 72s. 6d. retail. The aluminium model is priced 57s. In common with other Elga appliances the Conquest kettle is covered by the firm's special insurance plan in which the purchaser may insure his kettle against any electrical breakdown at a rate of 4s. 6d. for three years.

The new Conquest kettle costs 72s. 6d.

For the Electrical Trade

TRADE PUBLICATIONS

INFRA-RED HEATING.—A new booklet issued by Philips Electrical Ltd., Century House, Shaftesbury Avenue, W.C.2, describes in its sixteen pages the use of infra-red heating in the rearing of livestock.

WIRES AND CABLES.—Ward & Goldstone Ltd., Pendleton, Manchester 16, have issued a new edition of their wires and cables catalogue.

COMMUNICATION EQUIPMENT.—The first comprehensive post-war catalogue issued by Phoenix Telephone and Electric Works Ltd., 38 Newman St, W.1, contains eight sections devoted to the various facets of the company's production. The whole catalogue is bound in a stout attractive loose leaf binder.

The Life of a Meter Jewel

RESULTS of a further stage in E.R.A. research into instrument jewels and pivots—originally commenced in 1936—are brought to light in the publication of the fourth interim report (Ref. T/T48) on this topic. Although most of its content is concerned with new sapphire/steel bearings and complementary factors, the report commences by continuing from an earlier report (Ref. T/T39), giving results of tests on those of the original bearings which had not then completed their lives. These units, on which work had commenced, possessed optical axial angles hanging from 0° to 90°. It had been recommended, however, that jewels having angles in a band from 75° to 90° should be used in service. Hence the new bearings, with which investigations were continued, had axial angles lying within this range.

Jewels Investigated

Initially, the jewels discussed are those having angles of 75°, 80° and 85°. In all cases the results obtained were particularly bad when the bearings were run dry. For an increase in the frictional resistance of the bearing greater than 6·25 dyne cm, the average life of each group of jewels lay between one and two million revolutions—as against values up to 1,000 times greater for jewels in the original test. Although initial conditions of both jewel and pivot were good, a microscopical examination at the end of the test showed quantities of both steel oxide debris and particles of sapphire. Large areas of abrasion were observed—somewhat unusual when the relatively low life revolutions are considered. When the jewels were run lubricated, however, increases varying between 300/1 and 450/1 in the average life revolutions were recorded, which says much for the value of correct lubrication.

Right-angle Jewels

Units having optical axial angles of 90°, however, present a better picture. Results of two major tests, on batches of such bearings delivered in 1937 and 1946, show average life revolutions, without lubrication, of some 500 million, individual results varying between the wide extremes of 3 and 2,000 million. These abnormal differences between jewels of the same (1937) batch led to examinations being made to discover if the planes of the atomic structure in the jewels showed similar variations. The difference between each jewel, however, was found to be so small as to discount this being the source of the anomalies. Further investigations were made with specially selected 90° jewels, none of which had mechanically tested surfaces—the method by which fragile surfaces are eliminated. From these cases, however, no definite conclusions can be drawn and hence to evaluate the effect of surface testing on jewel life further tests on jewels cut from the same boules, but subjected to surface testing are being made.

The report then continues by discussing the various problems presented by the results, paying particular attention to those units in which wide variations in life revolutions between individual jewels obtained. The pros and cons of a suggestion that the key to the life of a bearing depends upon the thickness and/or quality of the polish or flowed layer is debated and the value of surface testing discussed in relation to this theory. Also discussed is the extraordinary effect of "Pennsylvanian" meter oil in prolonging the life of the bearing, which the present series of tests confirms. In its general summary and conclusions on work to date, given somewhat later, the report states that the one outstanding result of the research is the development of these oils and the remarkable results obtained from their use.

Considerable attention is devoted to repolishing by the "cold polish" method, as it had been suggested that this method may be substantially different to the normal or flowed polish on a sapphire jewel. Units polished by this method (using a polishing medium of water and calcined magnesia and a tool made from Australian Jarrah rotating at 40,000 r.p.m.) were life tested and good results obtained. General observations on these results appear to be unable to confirm, however, that "cold polishing" is not, in fact, flowed polishing.

Another factor, the relation between specific pressure and life revolutions, receives considerable attention, obtaining, by experiment, a law relating these two revolutions. Results indicate that life revolutions may be equated to a product of the reciprocal of the specific pressure raised to a certain power and a constant. For a long life bearing the report concludes that it is necessary to keep the specific pressure as low as possible. This can only be ensured by using a suitably large pivot radius, but past practice has been aimed at keeping this radius too small, probably for "low starting current."

Glass "Jewels"

Supplementary to the main investigation, work was carried out on "jewels" made from glass, osmium rhodium, and synthetic spinel. In discussing results of these investigations, particular attention is paid to glass—concluding that, without lubrication, it is practically useless. With the use of meter oil an average life of 300 million revolutions could be obtained.

Contact Wear in Contactors

TWO further E.R.A. reports (Refs. G/T247 and G/T263) deal with tests to determine contact wear in 400 V, 75 A and 440 V, 150 A three-phase contactors. Although the two reports are separate documents, each dealing with one current rating, the work they describe is essentially correlated and is, to a large extent, an extension of pre-war tests on 400 V, 30 A contactors (reported in Ref. G/T103) forming part of a general programme of research on contactors. Considering initially the 75 A contactors, tests for both wear and heating are described, these being carried out as far as the available test facilities would permit. More restricted in scope than the pre-war tests, they serve to show the rate of contact wear under full load conditions, and the temperature rise of contacts when fully loaded for long periods.

Four makes of contactor were tested, all tests being made at 400 V, 75 A, three-phase at 0·5 lagging p.f. Resistors and air-cored reactors were used as the load. These were connected in star and the neutral point earthed. Closing magnets were energised at 230 V from the same supply through motor-driven controllers to give rates of operation of 570 and 2,700/hr. Contacts were closed for one-third of each cycle—at the lower rate, therefore, they remained closed for 2·1 secs and open for 4·2 secs. For the heating tests, units were enclosed in iron cases some 2,000 cu in. in volume, temperature being measured by thermocouples.

Results show that contact wear is directly proportional to the number of operations and unaffected by the operating frequency. The rate of wear increased materially on reduction of the contact force. An unusual feature of the wear is its dependency on phase rotation, different pairs of contacts, having the same contact force, wearing at different rates. There is, moreover, no evidence of an increase in mean temperature with time after the contacts had been closed for a considerable time.

With the 150 A contactors tested for wear in very much the same way, similar results were obtained. Of the six units tested, five models gave performances which did not vary appreciably, but it is notable that the remaining unit, having "Elkonite" inserts at the base of the contacts and also resiliently mounted, had a smaller rate of wear. All contactors exhibited contact bounce which was pronounced in some makes.

The report states that rigid conclusions cannot be drawn of the advantages of magnetic blow-outs—but the greatest wear was exhibited by those contactors having the most powerful blow-outs.

NEWS OF THE WEEK

E.T.U. Guerilla Strike Tactics Again

Employers' Conciliatory Offer has been rejected

ON Monday last "guerilla" strikes of electricians in the contracting industry again took place at selected sites, as the E.T.U. had threatened. A further national one-day strike is scheduled for Monday next.

The Union's plan has gone forward despite the retaliatory action proposed by employers in the National Federated Electrical Association against operatives who join in the national one-day strike. Mr L. C. Penwill, director of the Association, in announcing this new action last Thursday, said that for every day an operative joined in a strike there would be no work available for him on one further day. Thus, employees striking on 18 Jan. would not be given work on the following day. The same procedure would apply should token strikes occur on days other than 18 Jan.

The "guerilla" strikes are taking place on different days at various sites. On Monday last, at Scunthorpe Works, the majority of 260 electricians employed there were reluctant to strike, according to reports. These men were faced with the likelihood of disciplinary action by the Union if they refused to obey the instruction of the Union.

On Wednesday of last week, Mr Penwill, in talks with conciliation officers of the Ministry of Labour, said the Executive Council of the N.F.E.A. had decided to offer 1½d. an hour in wages subject to two conditions. Firstly that it would not apply to most parts of countries on or nearby the south coast of England or in East Anglia where electrical contracting firms were having difficulty in finding work; and secondly that the E.T.U. should agree to a reduction in overtime rates to time-and-a-third for the first six hours overtime each week. Explaining the first condition, Mr Penwill said that employees in the accepted counties had received greater increases in pay than those in other areas since the war. These men amounted to about a fifth of those employed in the industry. He maintained that the likely saving to employers in overtime payment would be exceeded by cost of the proposed rise in hourly rates.

To this offer, officials of the E.T.U. replied that they would be willing to begin negotiations immediately if the N.F.E.A. would make the increase of 1½d. an hour without conditions, or, if the employers would raise wages now by that amount without conditions the Union would accept arbitration on the question of whether any further increase should be granted.

Total Abolition of Australian Controls

SPECULATION on the outcome of the Commonwealth Finance Ministers' talks in Sydney is increasing, especially on the subject of possible relaxations of the import controls. Some easement in the controls was forecast in these columns on 24 Dec., although it was stated at that time that total abolition might be too much to hope for. Latest reports from Australia indicate that advantageous changes will become effective as from 1 April, and it is expected that goods worth about £40 million will be allowed into the country from the U.K. If this should prove to be the case, it will bring most categories of British goods back to 1951 levels.

LOSSES ON GOVERNMENT MATERIALS TRADING

In a report and accounts of trading of commercial services run by Government Departments published last week by the Comptroller and Auditor-General, the Ministry of Materials is stated to have made a net loss of £45,282,600 during 1952-53. Such a loss was not unexpected following falls in market prices of many commodities. Largest losses incurred were £18,504,555 on zinc which was restored to private trading at the beginning of last year; over £14 millions on jute; some £10½ millions on timber; £7,224,617 on lead, in which case a free market was restored on 1 Oct, 1952; and £2,000,166 on tungsten.

Losses on zinc and lead arose partly from the sale at current prices of stocks bought under forward contracts during the 1951 scarcity. These have been regarded as an insurance premium paid to secure the continuance of supplies.

World Conference on Peat in Dublin next July

RUSSIA excepted, Eire is probably the leading country in the field of peat harvesting and utilisation. At present she has two peat-burning power stations and several others are being built. It is therefore appropriate that Eire should be staging the first International Peat Symposium this year. It will take place in Dublin between 12 and 17 July. Many countries in Europe and N. America will be attending, and it is known that delegations will be representing Great Britain, France, Germany, Norway, Sweden, Denmark, Finland, Switzerland, Holland and Iceland, as well as Canada and the United States.

Peat technicians, scientists and experts will submit papers which will be circulated before the conference and discussed. Scope of discussions is expected to cover such subjects as Open-Cycle Peat, Fired Gas Turbines, Excavating Methods, Gasification of Peat, and Domestic Use of Peat.

First Policy Statement of Dealer's Association

AN eight-point statement of policy has been issued by the Electrical Appliance Dealers' Association. This is the first announcement of its policy to be made by this Association, formed some time ago as an electrical section of the R.T.R.A. It expresses dissatisfaction with existing discount structures and recommends that discounts on all appliances should go only to the *bona fide* retailer. The Association's desire is to see good clean competition without recourse to price cutting.

In the first place appliances should be sold to the public only by *bona fide* traders, the E.A.D.A. maintains. These traders are defined, and they are opposed to firms without showrooms or who do not carry stocks securing trade discount. The preparation of a trade register of dealers conforming to their definition is also recommended.

The policy also advocates minimum hire purchase terms. "No deposit" terms and uneconomic H.P. terms are deprecated, and the Association does not approve of terms offered by State organisations. Finally, it is recommended that a discount, lower than the retail trade discount, be negotiated for firms engaged in wiring work, etc., and for large users not appearing on a schedule.

Trade Reactions to Purchase Tax Reductions

R.D.A. state that Chancellor's Announcement creates Uncertainty

LAST week's sudden reduction in purchase tax rates has been welcomed by all concerned, of that there can be little doubt, as any relief in this tax coming at any time will assuredly find favour among manufacturers, wholesalers and retailers alike. Commenting on the relaxations on space and immersion water heaters, a spokesman of B.E.A.M.A. said the industry was more than grateful. It had been recognised that there were now adequate supplies of electricity for all purposes, he said, and official discrimination against electricity for heating purposes was finished. The Association's official also acclaimed the return to parity between gas and electric fires and water heaters which had been a thorn in the side of the electrical industry for a long time. The Electric Water Heater Manufacturers' Association were equally jubilant at the announcement.

Everything in the garden is not as rosy, however. Mr D. Barber, secretary of the Retail Distributors' Association, said that although the reductions were always welcomed, the uncertainty as regards trade in general had not been altered. The Chancellor had been good enough to accede to the request that tax changes be made in January but there was no indication that these were the only changes. What was required was an assurance that there would be no further alterations this year or before the Budget. If a further relief was to be granted then it should be announced before the end of this month, he said. Otherwise the present situation might well create even more serious problems.

This, of course, raises the problem that the time of the Chancellor's announcements would be known, and Mr Barber went on to say that with the majority of goods it would not matter a great deal if the date of announcements was known. If the changes were made in January, expectation would not be likely to affect the Christmas trade. He conceded, however, that some industries would not favour the practice, and understood that B.E.A.M.A. and motor car industry did not want it known in advance when changes were to be made. We understand the R.D.A. are to place the point of view before the Chancellor.

Parking Light from Mains

A CAR owner was summoned at Birmingham last week for placing an overhead wire over the street without permission, and also for parking without lights. It appeared that he had one of the popular, but illegal, parking lights on the offside of the car roof and ran a flex from it to a tree and thence to a bedroom, where it was connected to the mains. He pleaded guilty to both charges and was granted an absolute discharge on the first and fined £1 for not having lights. The stipendiary magistrate commented that he presumed if the wire was laid across the pavement, no offence would have been committed. When told that that might have caused an obstruction, the magistrate said no doubt some excuse would have been found to make a charge.

BOARD TOLD TO FORGET DEBT

SUING a woman for payment of an outstanding debt of £13. 19s. 3d. for electricity supplied, the S.E. Electricity Board was advised at Brentford county court last week to forget the debt. The woman had given evidence of means and said the debt had been incurred in 1952 before she and her husband had separated. She said she was willing to try and repay the money, but Judge Tudor Rees said that she could not pay it even if she was liable, but, in fact, her husband was liable.

PAY-AS-YOU-VIEW TV TRIED IN AMERICA

WITH only the one television service in this country, the "Pay-as-You-View" service for particular programmes which has been tried out in the U.S. has had little effect on the British TV public. The system of television by subscription was tried for the first time at Palm Springs some weeks back when the attraction was a motion picture. The scheme involved a Telemeter box, easily attached to the set, and containing a magnetic tape which indicates the cost of the programme and counts the money inserted as payment. Tuning into the station, the viewer receives only a blur until money is inserted.

This system alone has many advantages, and applied in this country would meet a number of the difficulties raised by sponsors of special features. But the Telemeter is also equipped with a push-button which enables the viewer to talk back to the screen. This, of course, provides great opportunities to non-commercial stations specialising in educational programmes. In fact, night-school at home is the logical outcome. The box was developed by Dr Louis N. Ridenour, and the company is International Telemeter Corpn.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS.—B.S. 1133: Section 19: Packaging Code; Use of desiccants in packaging; B.S. 2063: Studio spotlights; B.S. 2066: Balata belting; B.S. 1568: Magnetic tape sound-recording and reproduction for programme interchange (Revision); B.S. 2062: Gear hobs.

DEFENCE REGULATIONS. — 21st Ed., printed as in force on 27 Dec. last, with appendix of statutory authority. H.M.S.O., 3s. 6d.

PURCHASE TAX ORDERS, 1, 2 and 3. H.M.S.O., 2d. each.

REPORTS OF H.M. INSPECTORS OF MINES, for 1952 in Scottish Div. H.M.S.O., 1s. 3d.

U.N. Report on Trade between Europe and the Far East

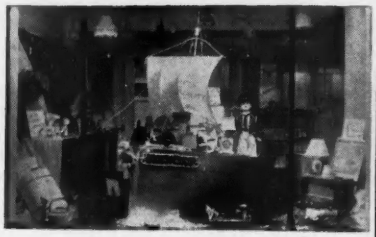
THE problems of expanding trade between Europe and Asia is the subject of a report, "A Study of Trade between Asia and Europe," published in Geneva by the United Nations. The report considers methods by which Europe can help the Far East with their development programmes, and vice versa. Among the suggestions of ways in which the two continents can help themselves is the appeal to expand sales, particularly by sending governmental or private trade missions to the Far East. European firms should develop joint enterprises and direct investments, the study suggests.

On the subject of Asian imports of capital goods power generating machinery is listed high among the requirements of the many development plans. In the Far East's special economic environment development does not aim at saving labour but at employing it.

Management Studies

A SEVEN-WEEKS' residential course for the study of higher management opened at the Brooklands Technical College, Weybridge, on Monday. It is organised by the S. Eastern Division of B.E.A. and is intended for the Division's chief officers. Among those attending are the Divisional accountant, secretary, establishments officer, chief generation engineer, and Littlebrook's station superintendent.

Much of the equipment installed for Italy's new television service was made in this country by Marconi's Wireless Telegraph Co., Ltd., for Radio Auditione Italiana. At the official opening ceremony last week, were (left to right) Marchese Marconi, Mr H. A. Lewis, the British co.'s chief of broadcasting; Dr R. Chisdelli, managing director of Italian Marconi Co.; Dr S. Bertolotti, technical director of T.V. with R.A.I.; and Sir Noel Ashridge, director of the British co.



Three of the successful window displays in the Eastern Board's Christmas competition. L to r, March, Rickmansworth and Ampthil

FACTORY EQUIPMENT

OVER 100 exhibitors have booked stand space at the second National Factory Exhibition which is to be held at the Horticultural Halls, Westminster, between March 22 and 26. The exhibition will be opened by Lord Rochdale, president of the N.U.M. The Duke of Edinburgh has consented to become its patron for 1954. On view will be fork-lift trucks, power-operated jacks, machines for packing, tying and labelling cartons, storage racks, office equipment, internal call systems and canteen equipment. Several items will be making their debut at this exhibition.

Scientific Instruments and Apparatus on Show

THE 38th annual Exhibition of the Physical Society is to take place at the Imperial College of Science and Technology between 8 and 13 April. The display will be entirely located in the College's Physics and Chemistry Depts. Applications for tickets should be made to the Secretary of the Society at 1 Lowther Gardens, Prince Consort Rd, S.W.7, but tickets will not be despatched until March. We understand that visitors are promised a higher standard of exhibits this year than ever before, and this will amply compensate for the slightly smaller display than usual. Particular care has been taken to ensure a better quality in the items on show and an unusually large proportion will be new or novel equipment. As in previous years a comprehensive Handbook will be available (price 6s., or 7s. 3d. by post).

Smoothing Things Over

FOLLOWING the introduction of their new steam-or-dry iron, Hoover Ltd. have added another film to their growing library of documentaries featuring this product. "Smoothing Things Over" is the title of this two-minute advertising film in which Cicely Courtneidge plays the lead. It has been produced for the company by Publicity Flms Ltd., in association with the Film Producers Guild Ltd., and has now started on its round of cinemas throughout the U.K. Versions are available in both 16 mm. and 35 mm. Hoover now have five films in circulation. Others are "All the World Over," "It's About Time," and "Consider the Carpet," all of which deal mainly with their vacuum cleaners, and "Time Off My Hands," which features the washing machine.

High Standard in Eastern Board's Xmas Display Competition

ONCE again a high standard was achieved in the annual Christmas display competition organised by the Eastern Electricity Board. As last year the contest was divided into three classes, for large, medium and small showrooms, and the appearance of both windows and interior taken into consideration in the judging. Winners among the large showrooms were Tottenham who thus repeated their success of 1951, but the other two winners gained the distinction for the first time. They were Rickmansworth, among medium-sized service centres, and Ampthill (Beds) in the third category.

The judges also chose the best display in each of the six sub-areas, although the judges' choice here excluded consideration of the area winners. Sub-area winners this Christmas were service centres at Watford, March (an area winner last year), Downham Market, Clapham, Maldon (area winner in 1951), and N. Chingford and Harlow who tied in the Northmet sub-area. All the Board's showrooms (nearly 150) took part in the competition. This is the fifth year that this display contest has been organised.

Public Speaking Contest opens Next Tuesday

THE first of the area contests in E.D.A.'s 1954 Public Speaking Competition will be held at the Lighting Service Bureau, on 19 Jan. Nine candidates in the London area will take part in the men's competition—8 from the London Electricity Board, one from the B.E.A. London Division. These speeches will be in the morning. In the afternoon there will be a joint contest in which six women candidates from the London, South-Eastern and Southern Boards will participate. The subjects for this year's competition are "Life without electricity," "Bringing electricity to rural areas," "The place of electricity in the national economy" and "The housewife in the reigns of the two Elizabeths."

Anglo-U.S. Materials Handling Affiliation

THE international advancement of materials handling takes a major step forward following the affecting of an affiliation between our Institute of Materials Handling and the American Material Handling Society. The move was announced by the Institute last week. It is intended to promote "understanding and co-operation between the two organisations for the furtherance of common objectives."

Commercial Officer explains Help for Exporters

IT WILL be recalled that Mr D. Heathcoat Amory, Minister of State at the Board of Trade last month inaugurated a campaign to make the Government's Export Services better known (see our 17 Dec. issue). By way of explanation Mr E. J. Joint, one of H.M. Ministers (Commercial) abroad has written an article describing a typical day in his life. Mr Joint has represented U.K. commercial interests in Rome since 1951.

He explains that his main job is to find markets for British goods. He endeavours to obtain an objective view of market prospects and to inform the British exporter how and where and why he can profitably sell his goods. Mr Joint tells of his routine study of local conditions and affairs, his receiving British businessmen, his entertaining useful local personalities, his visits and attendance at lectures, and the preparation of market reports on all kinds of commodities as well as a monthly economic report.

In conclusion he points out that the Board of Trade maintains a network of officers abroad specially trained to help the British exporter increase his business. Whatever the problem, if the answer is not already on the files, the Board of Trade representative will always try and find out the solution.

The First Half-Century

The list of Christmas loads shows that although few new supply stations have been opened during the past year the old stations have been connecting up additional customers at a gratifying rate. An agregate rise during 12 months from 212,028 kW to 274,278 kW means that the plant and mains people, the wiring contractors, and the makers of lamps, motors and accessories, have not been altogether idle. Of course, maximum loads and connections to mains are quite different things, but when all the stations are lumped together the rise in the one is a rough index of the rise in the other.—*From our issue of 7 Jan.*, 1903.

Local Productivity Committees are Flourishing

THE formation of local productivity committees has proceeded at a much faster pace than was originally envisaged. These bodies are being set up in all parts of England, Scotland and Wales for the pooling of manufacturers' ideas on increasing production, particularly in so far as larger businesses can help the small firms. The idea was one of the first to be planned by the British Productivity Council when it replaced the former Anglo-American Council on Productivity. It was born only nine months ago and a target of 100 local groups was set. To date 75 committees have been inaugurated and a number of others are in the process of being formed. About 20 have been established in the past month. Such response appears adequate proof of the idea's success, particularly as the B.P.C. have done nothing except put forward the suggestion. Planning and actual formation of the local groups is entirely at the discretion of manufacturers themselves. Among centres where committees are being planned now are Oldham and Rochdale, Buxton, and possibly Northern Ireland, where there is no local committee at all at the moment.

Apart from Northern Ireland, the south-west of England has the least number of committees. This is only to be expected as it is a predominantly agricultural area, but the situation has been partially rectified by the recent formation of a productivity committee to cover Exeter and Devon. Plymouth already has its own local group.

The Midlands appears to be the most "production minded," particularly Birmingham. Programmes of events in that city are most comprehensive, and some indication of the keenness may be gained from the simple fact that in a recent slogan competition, there were 3,000 entries instead of the expected 300. Enthusiasm in Birmingham is rivalled by Scotland however, where in the past two months or so the number of local groups has risen to eight. Wales does not appear to be quite so enthusiastic, although we understand three committees exist there.

Probably the most beneficial activity encouraged by these committees is the inter-works visits, or "circuit-schemes" as they are called. They are flourishing particularly in London, Birmingham and Lancashire and have been enthusiastically supported.

New Branch Premises at Blackburn

NEW premises in Mincing Lane, Blackburn, was opened officially by the General Electric Co., Ltd., last week. The company's previous building in Darwen St, with stores in another part of the town, proved completely inadequate, but the new branch, which is twice as large as the old buildings together, should meet all the electrical requirements in the area. Particular attention has been paid to the arrangement of stocks. A special feature is the display of household equipment and lighting fittings in the entrance hall. The opening ceremony was performed by the Mayor of Blackburn, Clr. R. Weir.

At the luncheon following the ceremony, Mr Leslie Gamage, vice-chairman and joint managing director of the company, made some pertinent comments on the quality of British engineering. He said he wondered why we gave the impression that we regarded the Americans as supermen, sending teams to learn how to produce and going hat in hand for everything. We could learn from America, he admitted, but they could probably learn more from us. Mr Gamage said the Americans were masters of mass production, but the U.K. was unbeatable in quality production.

Display in the entrance hall of the G.E.C's new branch premises at Blackburn. Above is the Mayor, Clr. R. Weir, officially opening the branch. Standing behind him is Mr L. Gamage, the company's vice-chairman and joint managing director

Private Firm offers to Hire Out Refrigerators

A PROPOSAL that electrical refrigerators be installed in council houses at Aldridge, near Walsall, for a small weekly sum, has been put forward and is under consideration. We understand that the operation of such a scheme depends largely on the response of tenants occupying the 1,500 houses rented from the urban council. The scheme is being sponsored by a private firm who suggest that tenants should have the appliances at a weekly cost of between 2s. 1½d. and 2s. 5d. for ten years. This rental would include maintenance. The local Housing committee is expected to make a decision when the attitude of the tenants has been discovered.

NEWS IN BRIEF

Our congratulations to Dussek Bitumen and Taroleum Ltd. who are celebrating their golden jubilee. Their work on insulating compounds is well established in the electrical industry.

That the North of Scotland Hydro-Electric Board has many lessons for colleagues further south and for those advocating reorganisation of the nationalised industry, is one of the conclusions reached by Messrs H. A. Clegg and T. E. Chester in a survey of the Board's history in the Institute of Public Administration's journal.

Blaw Knox have recently secured a contract for the supply and design of transmission line towers to Norway. It is valued at £300,000, and was placed by Oslo Lysverker for the new 220 kV line between Hol and Oslo.

"Education and Training for Management" is the title of the first in a new series of booklets to be issued by the F.B.I. Education Committee. Published last Friday, it is a study of the attitude of industry to education and training for management.

We hear that Derby Cables Ltd. have completed their £370,000 order for 2,353 tons of cable destined for Russia. This was one week ahead of schedule.

A meeting is to be held at Frederick Rd depot, Salford, on 18 Jan. with a view to forming the North-Western Electricity Board's first brass band.

Further 14 employees of A.S.E.A. Electric Ltd., completed 25 years' service with the firm during 1953. They were presented with certificates and engraved wrist watches at the company's annual Christmas dance.

Number out of work in the electrical wiring and contracting industry in Lancashire, Cheshire and part of Derbyshire, is 147, while job vacancies total 153. Unemployed in the electrical machinery trade are 272, with a vacancy list of 587. Similar figures for the wire and cable-making industry are 267 against 73 vacancies.

ELECTRIC SUPPLY NEWS

Beeston

HOUSING tenants in the Beeston area on the new estates should have freedom of choice of domestic appliances, the Housing Committee of the Beeston and Stapleford U.D.C. has recommended. But the question of cost seems to be a thorny one, for some members of the U.D.C. have suggested that the installation of electric cookers and washboilers, together with the necessary wiring, instead of similar gas appliances now provided, would increase expenditure by as much as £25 per house. In the opinion of the East Midlands Electricity Board, however, this estimated cost appears to have been over-stated.

Berwick

BECAUSE electricity for forestry workers, houses is higher on the priority list than supplies for Border farms, the West Berwick branch of the National Farmers' Union has decided to protest to the Electricity Consultative Council for South-East Scotland and to N.F.U. headquarters. It was stated that 60 new houses proposed for Rochester, near Otterburn, were to get electricity before the agricultural needs in the Westruther area of Berwickshire were met. In their opinion the principle underlying this was wrong, as food production was more important than forestry.

Cardiff

THE proposed erection by the B.E.A. of a generating station on a site at The Leys, Gileston, would be quite wrong from a planning viewpoint—this statement of its planning officer has been unanimously approved by the Cardiff Rural Council. Objections were raised on the grounds of effect upon agriculture, housing, transport and amenities. Mr S. P. Youldon, the council's planning officer, in his report, stated that it was clear that the erection of a building of the type proposed in the area would completely destroy the amenities and could not be regarded as anything but an eyesore. He said it would be of little use the B.E.A. arguing that for economic reasons the generating station should go to The Leys, if adjoining local authorities had to embark on extensive schemes for the provision of services, housing, etc., financed out of public funds. Any such project, he declared, should be sited in an industrial area close to a centre of population and not at The Leys.

Isle of Man

THE total number of units sold by the Isle of Man Electricity Board during the year 1952/53 was 16·8 millions, an increase of just over 580,000 units. A further 273 consumers were connected bringing that total to 9,447. The increased tariffs imposed last year and economies in administration enabled the Board to show a satisfactory margin on the year's working, it is stated. Total income at £164,404 was over £13,000 higher than for the previous year, and the net revenue account shows a surplus of £2,878 compared with a £7,579 deficit in the preceding period. The average price obtained from private consumers was 2·10d. per unit, and from large power consumers 1·8d. p.u. The average price p.u. sold for all supplies was 2·148d. compared with 1·897d. in the previous year. The report adds that in the farm electrification scheme 11½ miles of o.h. h.t. lines, 100 yds of underground h.t. cable, and 11¼ miles of o.h. low tension lines have been installed. With the new 2,000 kW generating set installed at Peel power station, the Board now operates the largest post-war diesel engine station in the British Isles, it is claimed.

Peak District

The Development Committee of the Peak Park Planning Board has approved a proposal by the B.E.A. for the construction of a substation at Wigley Meadow Farm, Winster, subject to satisfactory siting and design, the use of suitable materials and the screening of the site by trees. In giving approval to the installation of overhead lines to supply electricity to premises at Flagg, Brampton, Parwich, Hathersage and Waterhouses, the Committee decided that care should be taken that the routes rendered the lines as inconspicuous as possible.

S.E. Scotland

A SUGGESTION for a concession in electricity charges for supplies taken during off-peak hours, was recently put forward by the Fife local committee to the South East Scotland Electricity Consultative Council. The Committee suggested that the Board should be asked to reconsider its present tariff for off-peak supplies in order to encourage greater use of electricity and if necessary to obtain from the B.E.A. a concession in charges for the bulk supplies taken during those hours. At last week's meeting of the Council it was reported that a reply had been received from the Area Board which stated that the point had been considered by the Central Authority some months ago. A few Area Boards apparently pressed for a concession on the lines suggested by the Council, and the Authority indicated their willingness to consider a reduced charge for supplies taken during the night time and an increased charge for supplies taken during the day-time. The majority of the Area Boards were against this proposal, and it was therefore abandoned.

South Wales

A NEW residuary tariff being introduced by the South Wales Electricity Board, is intended, as its name implies, to cover the few exceptional cases to which the Board's standard tariff cannot be applied and in relation to which special agreements are not appropriate. The Board's standard domestic commercial and industrial tariffs have already been published. By proposals for a standard farm tariff, submitted to the Consultative Council and at present under consideration, charges for supplies to farms will be placed on a uniform basis in the near future. Standard terms have also been approved for public lighting, and this new residuary tariff is, therefore, a formal measure necessary to complete the Board's tariff structure, but it is likely to affect only a few consumers.

York

THE city council is faced with a problem. Before nationalisation of the electricity undertaking, the city engineer carried out by direct labour the construction of three new substations. The city council is now being informed that the final account for the work was not settled before nationalisation and that it cost £700 more than had been estimated. The North Eastern Electricity Board, the Building and Planning Sub-Committee has reported, now refuses to pay the additional sum in full and has agreed only to pay for additional items amounting to about £100. The Sub-Committee has recommended that the matter be submitted to the Minister of Health for his decision.

LIGHTING SCHEMES

Bermondsey. The B.C. has decided to install mercury vapour lamps in the main road from Duke Street Hill, through Tooley Street, Dockhead, and Jamaica Road, down to Lower Road, and also Tower Bridge Road, at a cost of about £16,000.

Billericay. U.D.C. propose to borrow £7,534 for lighting schemes for Laindon High Road, Billericay High Street and Wickford High Street.

Esher. The U.D.C. has approved a scheme for improved street lighting at an estimated cost of £23,000.

Hornsey. The T.C. has been recommended to approve a three-year programme for the conversion of gas street lighting to electricity. The estimated cost is £30,000.

Kirkham. The U.D.C. is to improve lighting in Station Road, Moor Street and Ribby Road, at a cost of £5,565.

Stockton-on-Tees. The T.C. is seeking the sanction of the M.o.T. to carry out a £12,280 scheme for new main road lighting from High Street along Durham Road to the borough boundary. The borough engineer (Mr G. Cowan) has prepared new lighting schemes for three further main roads and these will be considered by the Council in due course.

Stourbridge. The T.C. has been recommended to approve a class A road lighting scheme estimated to cost £18,225.

COMPANY ACTIVITIES

THE year 1953 was a good one for the electrical trades, despite the falling off of orders during the earlier part of the period. Profits of the 102 leading firms in electrical and radio industries rose by £3,345,000 to £86,685,000 during the year.

That represented a rise of 4%, which goes against an 8% fall, which was the general experience of industrial companies as a whole, based on figures compiled by the *Financial Times*. Other interesting figures about the 102 companies shows that they put £11,441,000 to depreciation against £9,950,000. They paid out in cash £42,371,000, compared with £39,903,000.

They earned for Ordinary shareholders £22,771,000 against £25,218,000 but increased shareholders' payout from £5,969,000 to £7,448,000—not bad going.

Capital and revenue reserve allocations were slightly down at £19,256,000, as against £20,536,000. Issued Ordinary capital went up from £74,506,000 to £95,999,000 mostly by bonus issue, while capital and revenue reserves totals improved from £155,172,000 to £173,514,000. Net working capital employed went up to £248,408,000 as against £211,627,000.

Typical of the post-war expansion of the British electrical industry is the Electrical Apparatus Co., which manufactures electric motor-control gear, switch gear and instruments. It was only last month that the company applied for permission to deal in the 5s. Ordinary shares. Under the able guidance of Mr R. H. Barbour the firm has gradually emerged from the private company chrysalis into a full-fledged public company butterfly. Times change, and in some ways it is a pity that Mr Barbour, who has been governing director, has seen fit to gradually withdraw from control of the business. But fortunately there is to be no sudden change, which should insure that the policy he has so ably built up will continue under new management. The business appears to be well balanced between home and overseas trade, and an extension of the main works at St. Albans suggests that the future is viewed with optimism.

High marks go to the board of Marco Refrigerators for bringing the company very close to real profitable trading conditions again. For the year to September last there was a profit on trading of £7,151 against a loss on trading of £6,820. But after tax and other charges, there was not much in it. But Mr A. E. Leach, the chairman and managing director, who has worked so hard to regain profitability, reports in his annual statement that it was not until the commencement of the current year that there was any real and sustained upspring in demand and output for the type of refrigeration equipment manufactured by the group.

The results achieved so far are after some inevitable writing down involved in the disposal of material stocks rendered redundant by the implementation of a new production programme.

Mr Leach and the board feel confident that given a fair chance, the actions taken in order to boost demand in the buyers' market, both at home and abroad, will show satisfactory and profitable results.—*From our City correspondent.*

W. Canning and Co.

The directors have decided to apply to the Capital Issues Committee for permission to capitalise £300,000 of reserve by the issue to Ordinary stockholders of 1,200,000 fully paid Ordinary shares of 5s. each.

Electrical Apparatus Co.

The substantial advance in the profit for the past year was due to materials having been easier to procure, enabling production to proceed on a smoother and larger scale, Mr R. H. Barbour, the chairman, stated at the annual meeting last Friday. Orders have shown a tendency in the last few months to recover from the drop which occurred when the Korean boom ended, and unless a prolonged engineers' strike occurred, or some other untoward circumstance outside the company's control arose, excellent results should be shown again this year, he added. A contract has been let for the addition of two new bays in the main factory at St. Albans.

Jerusalem Electric and P.S. Corp. Ltd.

The problems involved in the proposed segregation of the Jordan assets and the possibility of the formation of a new company to administer the Jordan area of supply were still under active consideration, Mr H. G. Balfour, the chairman, stated at the annual meeting recently. In this connection it should be remembered that the Jordan Government, equally with the Israel Government, were successors to the Mandatory Government by whom the concession under which the corporation operates was granted. He hoped that the situation as it affected both the Israel and Jordan areas of supply would be clarified in the near future.

Marco Refrigerators Ltd.

There was little improvement in the demand for refrigeration equipment within the range made by this concern during the year ended 30 Sept. last, according to Mr A. E. Leach, the chairman. But the economies in operating costs and new developments in design and production methods have successfully stemmed the losses which were incurred in the previous year, he adds. Since the commencement of the new financial year there has been a gratifying and sustained upswing in demand and output.

Year to Sept. 30	£ Trading Profit	£ Net Profit	% on Ordinary Earned	% on Ordinary Paid	Ordinary Price High	Ordinary Price Low
1949	74,806	30,674	49	30	15/9	11/1
1950	40,187	14,763	20	17½	12/9	7/–
1951	36,569	11,401	15	7½	12/–	5/–
1952	– 6,820*	– 8,931*	—	—	5/–	2/6
1953	7,150	– 801*	—	—	3/3	1/7

*Loss.

Palestine Electric Corpn. Ltd.

The final plan for the participation by the Israel Government in this concern has now been approved at a Cabinet meeting. This plan constitutes an offer by the Israel Government to purchase 2,800,000 shares registered in London at a price of 29s. 6d. each, the sum to be paid in fifteen annual instalments commencing 1 Oct. next, and bearing 4% interest. Payment for the 1,080,000 shares registered in Israel is to be made in the form of a Government dollar bond to the value of £1 sterling plus the equivalent to approximately 5s. per share in cash.

Radio Rentals Ltd.

The continued expansion of this concern over the past few years has been remarkable. We have already reported a further rise in the trading profit (31 Dec. issue), and Mr H. F. Hunt, the chairman, now reports that the growth in the number of the company's subscribers last year was greater than ever.

Dividends Declared

W. H. Allen, Sons and Co.—Interim of 5% (*same*).

Powell Duffryn.—Interim 3% (*same*).

Greenwood and Batley.—Interim of 5% (*same*).

Sayings OF THE WEEK

"New industries in Wales were captained by 'foreigners' because the people of the valleys were too shy to accept executive posts," . . MR W. MARTIN-HURST, managing director of Teddington Controls Ltd., stated last week.

"Although we send productivity teams to study production methods in America, the Americans could learn just as much from British industry as we could learn from them." . . . MR LESLIE GAMAGE, vice-chairman and joint managing director of the G.E.C., speaking at Blackburn.

"If the public believe that there will be further tax cuts, then for the next three months the state of uncertainty which we have been trying to avoid will not only persist but will be aggravated." . . . MR ERIC M. GAMAGE, chairman of A. W. Gamage Ltd., writing in *The Times*, regarding last week's purchase tax changes.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders, unless otherwise stated.

18 Jan.—Coseley U.D.C. Sodium street lighting along part of Birmingham trunk rd.—See 7 Jan. issue.

18 Jan.—Hayes and Harlington U.D.C. Supply of medium and l.v. cables, conduit, fittings and accessories, discharge lamps for street lighting, cast iron and concrete columns, time switches and repair of same. Engineer and Surveyor, Town Hall, Hayes, Middx.

20 Jan.—Manchester T.C. Supply of about 80 transport and bollard batteries. City Surveyor, Town Hall.

20 Jan.—N. Ireland. Electrical requirements for Tyrone and Fermanagh Hospital.—See 7 Jan. issue.

20 Jan.—Lutterworth R.D.C. Wiring, etc., in 100 houses.—See 31 Dec. issue.

20 Jan.—N. Ireland. Electric Equipment for N. Antrim Hospital Management Committee.—See 31 Dec. issue.

20 Jan.—Romsey and Stockbridge R.D.C. Electrical installation in 10 houses at Longstock and 4 at Nether Wallop. W. A. Tanner, clerk of council, Council Offices, Duttons Rd, Romsey, Hants. Deposit £1. 1s.

21 Jan.—Plymouth T.C. Supply of lamps wanted during 1954-55.—See 7 Jan. issue.

21 Jan.—Carlisle T.C. Electrical installation in shops and flats at Harraby. L. J. A. Stow, City Engineer, 18 Fisher St.

22 Jan.—Edinburgh T.C. Electrical installation in Abbeymount washhouse. City Architect, City Chambers.

22 Jan.—Morley (Yorks) T.C. Supply, erection, etc., of duplicate booster pumps with motors and switchgear. Consulting Engineers, Silcock and Simpson, 10 Park Row, Leeds. Deposit £5.

23 Jan.—Halifax T.C. Electrical installation at Crossfield Bus station. Borough Engineer, Crossley St. Deposit £2.

23 Jan.—Manchester T.C. Supply of switches and cable material.—See 7 Jan. issue.

23 Jan.—Hebburn U.D.C. Electrical installation in 190 houses on Monkton Lane site. Engineer and Surveyor, Council Offices, Argyle St.

23 Jan.—Lanarkshire. Electrical installation in new Protestant primary school at Spittal. Applications by above date to W. C. Brownlie, county clerk, Lanarkshire Hse., 191 Ingram St, Glasgow.

25 Jan.—Peterborough T.C. Electrical work at Walton secondary modern school. F. J. Smith, architect and surveyor to joint education board, Town Hall. Deposit £2.

25 Jan.—Hythe (Kent) T.C. Street lighting scheme along trunk road A. 259 comprises (*a*) supply and erection of 83 concrete columns and supply and fitting and wiring of 83 400 W lanterns and equipment; (*b*) supply and erection of 83 concrete columns and fitting and wiring of 83 lanterns; and (*c*) supply of 83 400 W mercury discharge lanterns and equipment. Borough Surveyor's Office, Municipal Offices. Deposit £2. 2s.—Advertised in this issue.

25 Jan.—Bentley-with-Arksey U.D.C. Electrical installation in 22 houses in Ausdell Rd. Surveyor, Council Offices, Cooke St. Deposit £2. 2s.

25 Jan.—Doncaster T.C. Electrical installation in 18 flats and 11 shops on Beckett Rd, site 2 (Sub-contract 378). Borough Architect, 15 South Pde. Deposit £1.

25 Jan.—Cockenzie and Port Seton T.C. Sodium street lighting. See 7 Jan. issue.

25 Jan.—Dunfermline T.C. Electrical, heating and ventilation work at C.D. Report and Control Centre, Broomhead. Burgh Engineer, 7 Abbot St.

25 Jan.—Westminster T.C. Supply of lamps for 1954-55.—See 7 Jan. issue.

26 Jan.—Bath T.C. Installation in dwellings at Snow Hill.—See 7 Jan. issue.

26 Jan.—Roxburgh. Installation in houses at Bonchester Bridge.—See 7 Jan. issue.

27 Jan.—Wandsworth B.C. Tenders invited for (*a*) supply and erection of concrete columns, resiting steel columns, and installation of ancillary gear for group A street lighting; (*b*) supply of group A street lighting equipment with ancillary gear excluding lamps and jackets; and (*c*) supply of 140 W sodium electric discharge lamps and jackets. These are separate tenders. Borough Engineer, Municipal Buildings, S.W.18.—Advertised in this issue.

27 Jan.—Stamford (Lincs) T.C. Street lighting.—See 10 Dec. issue.

27 Jan.—Friern Barnet U.D.C. Supply of lamps for street lighting purposes from 1 April. Engineer and Surveyor, Town Hall, N.11.—Advertised in this issue.

29 Jan.—Belfast T.C. Supplies of electrical equipment.—Advertised in 7 Jan. issue.

29 Jan.—Bethnal Green B.C. Supply of lamps, etc., during year beginning 1 April. F. H. Bristow, town clerk, Town Hall, E.2.

29 Jan.—Dublin. Supply of four electrically-driven pumps for Common Use Oil Pipelines at Port of Dublin. Engineer, Dublin Port and Docks Board, East Wall Rd.

29 Jan.—Salford T.C. Thermal storage calorifier, centrifugal boiler feed pump, etc., at Blackfriars Public Baths.—See 24 Dec. issue.

29 Jan.—Belfast T.C. Supply and erection of telegraphs and operational telephones (Form N.1485), for power station West. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne.—Advertised in this issue.

30 Jan.—Edinburgh. S.E. Hospital Board require supply of electric lamps for one year from 1 Apr. Co-ordinating Officer for Supplies of the Board, 8 Drumsheugh Gdns.

30 Jan.—Durham. Supply of public address system for county agricultural show. Details from L. Rudd, County Agricultural Soc., 27 Sutton St.

30 Jan.—Huyton-with-Roby U.D.C. Supply of public lighting equipment, electric cables and flexes and electric sundries during year ending 31 Mar., 1955. Engineer and Surveyor, Council Offices, Derby Rd.

30 Jan.—Hendon T.C. Street lighting along Hendon Way and Watford Way. Applications by 16 Jan.—Advertised in 7 Jan. issue.

30 Jan.—Prestwich T.C. Supply of lamps and equipment for 1954-55.—See 7 Jan. issue.

1 Feb.—Manchester T.C. Electrical installation in 334 houses in Greenwood Rd, (contract 199a); 30 flats in Shadow Moss Rd, (193b), and 37 maisonettes and 31 flats in Cambridge and Newcastle Sts. Director of Housing, Town Hall. Deposit £1. 1s.

1 Feb.—Dublin T.C. Supply and installation of private automatic telephone exchange at Crooksling Sanatorium. Finance Dept., City Hall.

1 Feb.—N. Cotswold (Glos.) R.D.C. Pumps and auxiliary equipment and other works at Moreton-in-Marsh pumping station.—See 24 Dec. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 122 Queries answered this week

"Celec" theatre dimmers—makers of? E.B.—Curtis Mfg. Co., 26 Paddenswick Rd, Hammersmith, W.6.

Lanterns supplied under the names of Admirals — "Raleigh" etc. — makers of? S. E. C.—Brian Wynates Smith, 99/101 New Sumner St, Birmingham 19.

"Stent" convector heaters — makers of? F. W. H.—The Stent Precast Concrete Ltd., 1 Victoria St, S.W.1, ceased manufacture of this product about 5 years ago. Elements are still available.

"Arnold Foster Mother" piglet feeder —makers of? P. S. L.—Arnold and Sons, 54 Wigmore St, London, W.1.

"Humphreys" demagnetisers—makers of? T.E.—J. H. Humphreys and Sons, Blackriding Electrical Works, Werneth, Oldham.

"Speeko" shavers — repairers of? W. H. P.—Thompson and Capper Wholesale Ltd., Speke Hall Rd, Liverpool 19.

Battery operated clock about 6 inches diameter—makers of? B.E.M.—Anglo Time Corpn., Ltd., Brockhouse Mills, Blackburn.

"Triangle" taps and dies—makers of? M.O.W.—British Tap and Die Co., Ltd., Triangle Works, Town Road, Edmonton, N.9.

3 Feb.—Donegal. Installation in District Hospital at Dungloe.—See 24 Dec. issue.

5 Feb.—Dalkeith T.C. Installation in 74 houses at Woodburn.—See 7 Jan. issue.

5 Feb.—Bilston T.C. Supply and erection of 14 100 W metal filament lamps on concrete columns in group B on Bradley Lane housing estate. Borough Engineer, 20 Wellington Rd. Deposit £2. 2s.

6 Feb.—Consett U.D.C. Lamps for street lighting required in year ending 31 Mar., 1955. Surveyor's Dept., Council Offices, Medomsley Rd.

6 Feb.—Solihull U.D.C. Supply of electrical fittings and lamps, street lighting fittings and concrete columns during year beginning 1 Apr. Engineer and Surveyor, 90 Station Rd.

6 Feb.—Swansea T.C. Electric lamps and steel and concrete pillars for public lighting wanted during year beginning 1 Apl. Borough Engineer and Surveyor, Guildhall.

9 Feb.—Bath T.C. Supply during 1954-55 of car lamps, l.v. cables, discharge lamps, control gear and fittings, tungsten lamps and fittings, and steel columns, lanterns (groups A and B) and time switches for street lighting. City and Waterworks Engineers, Guildhall.

10 Feb.—Minehead U.D.C. Supply and erection of 20 steel columns with 3-80 W fluorescent lanterns with all ancillary equipment and wiring, for lighting of Park St, the Parade and the Avenue. K. G. Holman, Engineer and Surveyor, Blenheim Rd. Deposit £2. 2s.

12 Feb.—Belfast T.C. Supply and erection of heating installation at workshop and accommodation building of Power Station East (Form N.1401). Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

No date stated.—N. of Scotland H.E. Board. Construction of 33kV, 11 kV and lower voltage wood pole o.h. lines in Sutherland. Kennedy and Donkin, 12 Caxton St, Westminster, S.W.1. Deposit £2 2s.—Advertised in this issue.

5 Mar.—Belfast T.C. Seven 220,000 lb/hr stoker fired boiler units and other plant for power station West.—Advertised in 31 Dec. issue.

5 Mar.—Belfast T.C. Feed heating and condensing plant sets; and piping, steam receivers and associated valves, electrical controls, fittings, etc.—Advertised in 7 Jan. issue.

No date stated.—N. of Scotland Board. Lighting, heating and auxiliary cabling installation at Luichart Dam. Merz and McLellan, 72a George St, Edinburgh Deposit £1. 1s.—Advertised in 7 Jan. issue.

No date stated—Bristol. Supply of batteries, lamps and sundries to Southmead Hospital Group Management Committee. Contractors wishing to be included on list of suppliers should apply to C. C Hancock, secretary, Southmead Hospital, Bristol.

No date stated.—N. of Scotland H.E. Board. Lighting, heating and subsidiary services installation at Fort Augustus Group Control Centre. Engineers, Kennedy and Donkin, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 12 January

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	229	−2	285
,, (3 months)	220	+½	—
LEAD, refined pig, min. 99·97% purity (cash)	89½	−½	94½
,, (3 months)	88	−¼	—
TIN, refined, min. 99·75% purity (settlement)	665	−7½	956
,, (3 months)	630	+7½	942
ALUMINIUM, ingots 99-99·5%	156	—	166
ZINC, virgin, min. 98% purity (cash)	74½	−⅜	88⅜
,, (3 months)	72½	−1⅛	—
RUBBER No. 1, RSS, spot (per lb.)	17¾d.	—	25½d.
,, c.i.f. basis, ports, Mar. (per lb.)	17 1/16d.	+1 1/16d.	25d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51½	—	53
Mild Steel Tape (0·014 in.)	40	—	39⅝

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

31 Jan.—Iraq. Supply and erection of two alternator sets of 300 kW each, 400/300 V, 3-phase, 50 c/s, with control panels, step-up transformers and equipment, at Amarah. Transformers to be indoor type, 400 kVA, 400-230/6000 V, star/delta wound. (Tender No. 24.) Directorate General of Municipalities, Baghdad. B.o.T. (Ref: ESB 13294/53).*

6 Feb.—Egypt. Supply and erection at Abu-Zaabal factory of eight transformer stations ranging from 400 kVA to 1,600 kVA, 10,500 V h.t. side, with h.t. underground cables 10·5 kV and l.t. underground cables for 380/220 V. Documents from Chief Inspecting Engineer, Egyptian Government, 41 Tothill St, London S.W.1. Fee £10. 5s. per set. Ref: 44/M and E 200/1/7/2.—Advertised in this issue.

1 May—Kuwait. Supply of two 20,000 kW turbo-alternators for new power station. Also supply of two 250,000 lb/hr evaporation steam raising units, also for new power station. These are separate tenders. Specification available from President of Electricity Dept., Government of Kuwait, Kuwait, from 14 Feb.—Advertised in this issue.

Gazette

Announcements

COMPANIES ACTS

Etherington and Partners Ltd. Meeting of creditors and contributories will take place at Inveresk House (Room 401) 346 Strand, W.C.2, tomorrow (Fri.), at 2.30 p.m. and 3 p.m. respectively.

W. Cordwell (Distributors) Ltd. William J. Cordwell, 158 Chesterfield Rd, Ashford, Middx, has been appointed liquidator.

Chillair Ltd. Meeting of members to be held at 290 Finsbury Pavement House, E.C.2, on 5 Feb., at 11 a.m. to receive liquidator's report.

Ezee Appliances (Kingsbury) Ltd. Meeting of creditors will take place at 1 Broadway House, Mill Hill, N.W.7, on 8 Feb. at 3 p.m., to receive liquidator's report.

BANKRUPTCY ACTS

Receiving Order

Southend. Albert F. Ayres, electrical contractor of 104 Bridgwater Drive, Westcliff-on-Sea. Date of order, 30 Dec.

Great Grimsby. Brian T. Smith, electrical engineer and contractor trading at The Studio, Ramsgate, Louth. Trustee is L. F. McCulloch, CA., 26 South St, Mary's Gate, Grimsby.

Release of Trustee

Stoke-on-Trent. Douglas G. Edwards, electrical engineer, trading at 8 Blackfriars Rd, Newcastle-under-Lyme. Trustee was F. C. Ormrod, Official Receiver, 12 Lonsdale St, Stoke.

Dividends

Leeds. Leonard Peel, electrical engineer, of 216 Law Lane, Horsforth, nr. Leeds. First and final dividends of 5d. in £ payable at Official Receiver's Office, 29 East Parade, Leeds, on 22 Jan.

Trade Notes

Repair Depot. The Cambridge Instrument Co., Ltd., has opened a repair and service depot at 7 Norfolk Court, Norfolk St, Glasgow, C5. Telephone South 0349.

Service Agents. The Midland Dynamo Co., Ltd., 64 Belgrave Gate, Leicester, have been appointed as field service agents for the U.K. for variable speed control drives for the Kalio, Reading, Oerlikon and Boehringer fully fashioned knitting frames, manufacturing hosiery. The electrical equipment concerned is manufactured by (1) Reliance Electric and Engineering Co., Cleveland 10, Ohio, U.S.A. (Kalio and Reading); and (2) Schindler Aufzuge-und Motorenfabrik A.G., St. Gallen, Switzerland (Oerlikon and Boehringer). The Midland Dynamo Co. have also accepted the appointment as field service agents for the Midlands area for Metropolitan-Vickers Electrical Co., Ltd., whose equipments are fitted to similar imported American machinery.

Contracts Placed

Edmonton T.C. Improved lighting along Great Cambridge Rd, Eastern Electricity Board, £6,771.

Hendon T.C. Electrical work in Cricklewood Lane housing scheme, Eastern Electricity Board, £4,084.

London. Manufacture, supply, etc., of 150 lifts on housing sites. Express Lift Co., Ltd., £272,510; additional £57,090 for installation under sub-contract also accepted.

Peterborough T.C. Installations in 98 houses on Dogsthorpe North estate, M. F. Hansen and Co., £2,169.

Snodland (Kent) P.C. Lighting along main A.228 road, S.E. Electricity Board, £3,261.

BUSINESS PROSPECTS

Home

Aberdeen. A hall and second gymnasium at the grammar school is estimated to cost £155,500.

Accrington. C. of E. Authorities to build secondary modern school near Clayton-le-Moors cemetery. Estimated cost, £140,000.

Alva (Clackmannan) T.C. Forty houses to be built on Boll site.

Ayr. Dean of Guild Court has approved plans for 62 houses on Craigie estate.

Bathavon R.D.C. Erection of 34 houses at Corston, nr. Bath. Council's Architect, M. Whalley, 8 Cleveland Place East, Bath.

Battersea B.C. Tenders invited for erection of five blocks of flats (190 dwellings) on Anerley St site.

Bootle T.C. Application to be made to borrow £284,986 for 209 houses or flats in Balliol Rd and on Netherton estate.

Boreham Wood (Herts). Tenders invited for erection of Cowley Hill infants' school.

Bournemouth T.C. Improved lighting at Stokewood Rd Baths being considered. Renewal of wiring in Town Hall to be completed by stages;—next section is lower ground floor.

Chester T.C. Tenders to be invited for erection of 150 houses.

Clare (Eire). Hundred houses to be built in county.

Devon. Erection of country infants' schools at Bideford, Exmouth, Paignton, and Teignmouth. H. V. de Courcy Hague, County Architect, 97 Heavitree Rd, Exeter.

Dewsbury. R.C. church to be built at Chickenley at estimated cost of £15,000.

Droylesden U.D.C. Erection of 46 houses and 8 maisonnettes on Gloucester Rd site. F. Bradley, Penny Bank Chambers, 4 Wood St, Bolton.

Durham. Construction of Consett grammar, Newton Aycliffe modern, Peterlee infants' and Peterlee junior mixed schools. G. R. Clayton, County Architect, Court Lane.

Edinburgh. Dean of Guild Court has approved plans for erection of offices off George St for Sun Insurance Co. Architect is T. Waller Marwick, 7 St. Colme St, and estimated cost is £100,000.

Elham (Kent) R.D.C. It is proposed to erect 36 houses at Hawkinge and 3 at Postling.

Evesham R.D.C. Tenders to be invited for wiring of existing houses at Radford.

Falkirk. Plans in hand for primary school at Stenhousemuir.

Gateshead. Layout plans to be prepared for development of land at Lobley Hill. There will be a school, community centre, church, shopping centre, etc.

Halifax. £45,000 building licence to be granted to L. Harris Ltd. for factory extensions.

Hartlepool. Extensions costing £150,000 to be carried out at Pallister works of the Steetley Co.

Hawick. Dean of Guild Court has approved erection of hosiery factory in Union St for W. Gladstone and Co.

Havant and Waterloo (Hants) U.D.C. Seventy houses to be built at Purbrook and 30 at Bedhampton.

Hornchurch (Essex) U.D.C. Erection of 11 blocks of maisonnettes at Cranham. Surveyor, Council Offices. Also tenders to be invited for erection of 36 flats at Elm Park.

Houghton-le-Spring (Dur) U.D.C. Land at the Burn to be acquired for erection of 220 houses. Layout plans prepared for Rainton Grove estate.

Isle of Ely. Erection of divisional police station and court house on Old Mills Brewery site. County Architect, County Hall, March.

Keynsham U.D.C. Erection of 20 houses on Park West estate and 10 bungalows on Cameroons Close site. Engineer and Surveyor, Council Offices. Approval sought for erection of 467 houses on Park Rd estate.

Kidderminster T.C. Winton, Thorpe and Tunnadine. 100 Victoria St, Westminster, will probably be electrical consultants for lighting installation in Retail Market.

Lancaster. Ripley School Buildings to be modernised at cost of £90,000.

Liverpool T.C. Erection of Bankfield secondary school, Green Lane. City Architect, Blackburn Chambers, Dale St, Kingsway. Development of Mental Deficiency Colony at Greaves Hall. Banks. V. Collinge, secretary, Liverpool Hospital Board, 19 James St.

London. H. P. Cort-de-Lafontaine, 3 Lisson Grove, N.W.1, is architect for company hall and offices with underground garage in Aldersgate St for Gold and Silver Wyre Drawers Co. Estimated cost £168,000.

Luton. Construction of first stage of fire station at Studley Rd has been approved. Cost estimated at £20,000.

Maltby (Yorks). D. Byford and Co., Ltd. to extend Rotherham Rd factory.

Mayo (Eire). Treatment unit to be built at Mental Hospital; extra maternity accommodation at County Hospital, and District Hospital at Ballina; and improvements at County Home, Castlebar.

Middlesbrough. T. A. Crawford, 80 Borough Rd, has prepared plans for R.C. church in Amersham Rd.

Newark (Notts). Tenders may soon be invited for erection of 80 houses. R.D.C. is not objecting to building of 165 houses on R.A.F. station at Winthorpe by Air Ministry.

Norwich T.C. It is proposed to erect 696 dwellings on Heartsease estate, and 10 dwellings on Tuckswood estate.

Nottingham. University is planning £1,200,000 extensions to science dept. Work to be spread over ten years.

Oldham T.C. Construction of 32 old persons' flatlets on Limeside estate. Cameron and Middleton, chartered quantity surveyors, 21 Queen St.

Oswestry T.C. 74 houses to be built on Middleton Rd estate.

Peterlee. Construction of total of 144 houses at Acre Rigg for Development Corporation. A. V. Williams, general manager, Sholton Hall, Castle Eden, Durham.

Scunthorpe T.C. Plans in hand for civil defence control centre. Also for erection of 104 houses and 14 flats on New Brumby estate, 48 houses and 12 bungalows on Church Farm estate, 57 flats on Lincoln Gardens estate and 224 houses on Manor Farm estate.

Sidcup (Kent). Hospital Management Committee has approved improvements at Queen Mary's Hospital to include chest clinic and extensions to X-ray and physiotherapy depts.

South Shields T.C. Another attempt being made to obtain permission to make additions to town hall. Cost of scheme estimated at £80,000.

Southampton T.C. Application to be made to borrow £19,832 for renewal and improvement of electrical installation at various schools.

Southend-on-Sea T.C. Approval sought to plans for school for sub-normal children and high school for girls at costs estimated at £31,000 and £224,000 resp.

Stoke-on-Trent. Application to be made to borrow £222,936 for erection of Willfield county secondary school.

Uxbridge U.D.C. Erection of 146 houses, 72 flats and 12 bungalows, on Northwood Rd estate, Harefield, has been approved in principle.

Wakefield. Preliminary plans for secondary school at Crigglestone.

West Kilbride. J. A. Portch of Glasgow to build new factory in district.

Worksop T.C. Consideration being given to erection of new Town Hall with public assembly hall and municipal offices. Plans by Elder and Crowe, architects, London, to be revised.

Worsborough (Yorks). Everest Shoe Co., Ltd., have received Council approval to plans for extending their factory.

Overseas

U.S.A. Mr Howey of Erickson Tool Co., 23rd and Hamilton Ave, Cleveland, is interested in importing hearing aids of U.K. manufacture.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aquamatic 722,822, **Magnaflo** 722,824, **Norma.** 722,826, **Pumpak** 722,828. **Unoflo** 722,831. Class 7. Pumps. Sigmund Pumps Ltd., Team Valley, Gateshead 11.

Chromicon. 723,678. Class 9. Television apparatus and cathode ray tubes. Cathodeon Ltd., Radio Works, St. Andrews Rd, Cambridge.

Estrasil. 723,702. Class 9. Scientific, electrical and wireless apparatus and instruments. R.C. Electrical Techniques Ltd., 17 Pemberton Rd, Harringay, N.4.

Gecalloy. 720,666. Class 9. Magnets and magnetic cores all made from metal alloys or powders. General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Graviner 723,632. Class 9. Specification includes temperature indicators and regulators, etc. Graviner Mfg. Co. Ltd., 1/2 Babmaes St, Jermyn St, S.W.1.

Lamforte in design. 722,136 Class 9 Accumulator boxes or containers all made of plastics reinforced with asbestos or with glass fibres. Lamforte Ltd., Langley Rd., Pendleton, Salford 6, Lancs.

Revcon. 720,893. Class 9. Electric apparatus for use in controlling the speed of hoist and winch drives and the like lifting apparatus by means of current control. Laurence Scott and Electromotors Ltd., Gothic Works, Hardy Rd, Norwich.

Siegfried in design. B719,465. Class 9. Wireless and television sets, gramophones and talking machines. Mohamed Husain Ismail, 60 Newman St, W.1.

MEETINGS TO NOTE

THURSDAY, 14 JAN.

E.P.E.A. (Merseyside).—"Formation and Application of Tariffs." W. Gilchrist. Elect. Offices, Whitechapel, Liverpool, 7 p.m.

I.E.S. (Glasgow).—Presidential visit and social function.

I.E.S. (Manchester).—"Lighting for Textile Production." H. Hewitt. Textile Inst., 10 Blackfriars St, Salford.

I.E.E. (N. Midland).—"Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery." J. C. Macfarlane, J. W. Macfarlane, and W. I. Macfarlane. Elect. Offices, Ferensway, Hull, 7.15 p.m.

I.E.E. (N. Scotland).—"Street Lighting." T. L. Lappin. Royal Hotel, Dundee, 7 p.m.

I.E.E. (S. Midland).—"Transmission of Pictures by Radio." A. W. Cole. Winter Gdns Restaurant, Malvern, 7.15 p.m.

FRIDAY, 15 JAN.

INSTN. OF MECHANICAL ENGRS.—Thomas Lowe Gray lecture "High Temperature Steam and Gas Turbine Machinery for Marine Propulsion." T. W. F. Brown. Storey's Gate, London, S.W.1, 5.30 p.m.

I.E.S. (Edinburgh).—Annual dinner and dance at Grosvenor Hotel.

MONDAY, 18 JAN.

I.E.E. (London).—Discussion on "Role of the Consulting Engineer." T. G. N. Haldane. Savoy Place, W.C.2, 5.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—Film Night.

I.E.E. (Mersey and N. Wales).—"Researches on Circuit-Breaking by High-Voltage Circuit-Breakers, Especially Current-Chopping." A. F. B. Young. Liverpool Royal Instn., Colquitt St., 6.30 p.m.

I.E.E. (N.E. Radio and Measurements).—Discussion on "Will Transistors Oust Receiving Valves?" E. H. Cooke-Yarborough. King's College, Newcastle, 6.15 p.m.

I.E.E. (N. Staffs).—"Domestic Electrical Installations: Safety Aspects." H. W. Swann. Elect. Offices, Stoke, 7 p.m.

TUESDAY, 19 JAN.

I.E.E. (London Measurements).—Discussion on "High-Sensitivity Wattmeters." A. H. M. Arnold. Savoy Place, W.C.2, 5.30 p.m.

A.S.E.E. (London).—"Railway Signalling." J. P. Coley.

I.E.S. (Liverpool).—"Industrial Colour Matching Problems." A. Wilcock. Elect. Offices, Whitechapel, 6 p.m.

I.E.E. (E. Midland).—"Technical Colleges and Education for Electrical Industry." H. L. Haslegrave. Loughborough College, 6.30 p.m.

I.E.E. (N. Midland Utilisation).—"Royal Festival Hall: Electrical Installation." J. G. Hunter. Elect. Offices, 1 Whitehall Rd., Leeds, 6.30 p.m.

I.E.E. (N.W. Utilisation).—Discussion on "This Question of Power Factor." G. Knights. Visit of chairman of Utilisation Section, B. L. Metcalf. Engrs. Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland).—"Design Features of Certain British Power Stations." S. D. Whetman and A. E. Powell. Heriot-Watt College, Edinburgh, 7 p.m.

WEDNESDAY, 20 JAN.

I.E.E. (London Educ.).—Discussion on "Teaching of Magnetic Materials." Prof. F. Brailsford. Savoy Place, W.C.2, 6 p.m.

I.E.E. (London Utilisation).—Section dinner-dance at Cafe Royal.

I.E.S. (N. Lancs).—"Contractor's Lighting Problems." R. E. Wolstenholme. Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side).—"Lighting of Rail Grids and Marshalling Yards." K. Graham. Cleveland Scientific and Tech. Instn., Corporation Rd., Middlesbrough, 6.30 p.m.

I.E.E. (Sheffield).—"Colour Television." L. C. Jesty. Grand Hotel, 6.30 p.m.

I.E.E. (S.W. Scotland).—"Design Features of Certain British Power Stations." S. D. Whetman and A. E. Powell. 39 Elmbank Cresc., Glasgow, 7 p.m.

I.E.E. (S. Midland).—"Land Reclamation in England and Holland." W. H. Haile (Meeting with Civils and Mechanicals). Midland Inst., Birmingham.

I.E.E. (Southern).—"A.C. on Ships." B. C. Pyle. Technical College, Southampton, 6.30 p.m.

I.E.E. (Oxford).—"Heat Pumps." Miriam V. Griffith. Elect. Offices, 37 George St., 7 p.m.

A.S.E.E. (Southampton)—"Introduction to High Frequency Heating." R. J. Webb. Polygon Hotel, 8 p.m.

A.S.E.E. (Nottingham) — "Industrial Switchgear." A. T. Crawford and W. Fenwick. Elect. Offices, Smithy Row, 7.30 p.m.

A.S.E.E. (Manchester)—"Developments of Germanium Crystals." Mr Betteridge. Engineers' Club, Albert Sq, 7.30 p.m.

THURSDAY, 21 JANUARY

I.E.E. (London Utilisation).—"Electricity in the Wool Textile Industry." A. J. Francis and T. H. Carr. Savoy Place, W.C.2, 5.30 p.m.

TELEVISION SOC.—"American Television." J. Sieger. Cinematograph Exhib. Assoc., 164 Shaftesbury Ave., W.C.2, 7 p.m.

INCORP. PLANT ENGRS. (Blackburn).—"Power Factor Correction." C. W. Sutcliffe. Grosvenor Hotel, Lord St., 7.30 p.m.

S. WALES INST. OF ENGINEERS.—Annual dinner at Park Hotel, Cardiff, 6.30 p.m.

I.E.S. (Bradford).—"Glassware in the Lighting Art." M. Keenan. Elect. Offices, 45-53 Sunbridge Rd., 7.30 p.m.

A.S.E.E. (Kent)—Lecture at Bridge Cafe, High St, Tonbridge, 8 p.m.

FRIDAY, 22 JAN.

INSTN. OF MECHANICAL ENGRS.—"Graphical Solution of Transient Vibration Problems." R. E. D. Bishop. Storey's Gate, London, S.W.1, 5.30 p.m.

COVENTRY ELECTRIC CLUB.—Annual dinner and dance.

I.E.E. (Southern).—"Receiving Aerials for British Television." F. R. W. Strafford. Technical College, Weymouth, 6.30 p.m.

New Companies

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

J. L. Tomey Ltd. Manufacturers of and dealers in machinery, tools, instruments, gauges and meters and parts thereof, optical goods, jewellery, watches electrical, radio and radar equipment, etc. Cap.: £100. Dirs.: not named. Subs.: E. A. Clarke, 73 Downing Rd, Upper Norwood, S.E.19; and Sheila Miles, 50 Old Farm Ave, Sidcup.

L. Tomey Ltd. Manufacturers of and dealers in machinery, tools, instruments, gauges and meters and parts thereof, optical goods, jewellery, watches, electrical, radio and radar equipment, etc. Cap.: £100. Dirs.: not named. Subs.: E. A. Clarke, 73 Downing Rd, Upper Norwood, S.E.19; and Sheila Miles, 50 Old Farm Ave, Sidcup.

Joseph Tomey and Sons, Ltd. Manufacturers of and dealers in machinery, tools, instruments, gauges and meters and parts thereof, optical goods, jewellery, watches, electrical, radio and radar equipment, etc. Cap.: £100. Dirs.: not named. Subs.: E. A. Clarke, 73 Downing Rd, Upper Norwood, S.E.19; and Sheila Miles, 50 Old Farm Ave, Sidcup.

Hunt Bros. (Motor Factors) Ltd. Manufacturers of and dealers in motor car lamps, electric bulbs, clocks, mats and rugs, bumpers, etc. Cap.: £5,000. Dirs.: L. H. Hunt, 39 Woodlands Rd, Guildford; and K. C. Hunt, 36 Saffron Platt, Guildford.

J. Wolff & Co. (London) Ltd. Scientific instrument makers, manufacturers of and dealers in electro-medical and surgical instruments, etc. Cap.: £600. Dirs.: J. Wolff, 607 Endsleigh Court, W.C.1; M. Cohen, 66 Crystal Palace Park Rd, S.E.26; and B. J. Venoear, 46 Grecian Cres, S.E.19.

Smith & Nephew Engineering Ltd., 42 Tavistock Sq, W.C.1. Mechanical, electrical, general, civil and consulting engineers, etc. Cap.: £20,000. Dirs.: B. C. Lockhart-Jervis; S. Lovatt; G. Whittaker; and C. H. M. Dolezalek.

Appliances & Machinery (Industrial) Ltd. Manufacturers of electrical and mechanical apparatus of all kinds, etc. Cap.: £500. Dirs.: to be appointed by the subs. Subs.: L. B. Byron, 85 Tettenhall Rd, Wolverhampton; and L. A. Walker, One Grange Rd, Penn, Wolverhampton.

Mexford Electrical Co., Ltd. Cap.: £100. Dirs.: to be appointed by subs. Subs.: Jean Herbert; and Claire Moore, 128 Albany St, N.W.1.

G. A. Styles Ltd., North End Chambers, 78 North End, Croydon, Surrey. Manufacturers of precision mechanisms, manufacturers, electrical, mechanical, aeronautical, general, marine and motor engineers, etc. Cap.: £100. Dir.: E. J. Nicholls.

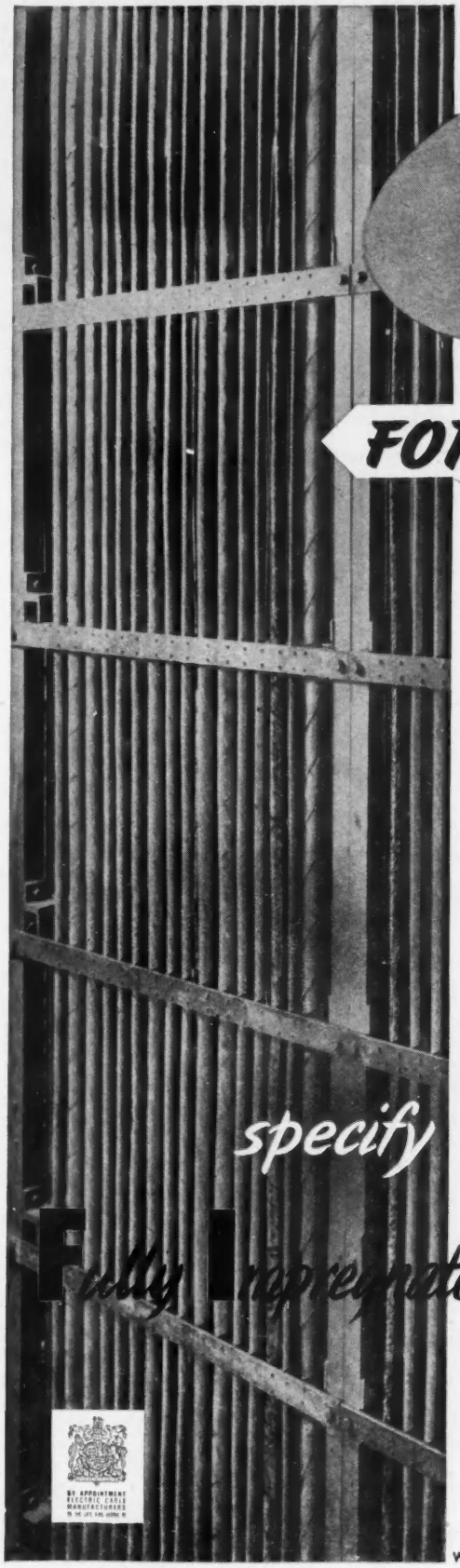
Electrofact Ltd., Winchester Hse, Old Broad St, E.C.2. Manufacturers of and dealers in electric, electronic, magnetic, galvanic, pneumatic, nucleonic and chemical instruments and appliances, etc. Cap.: £2,000. Dirs.: P. J. Oranje; and M. Buis.

North Western Electric Appliances (Oldham) Ltd., Victoria Works, 68 Yorkshire St, Oldham. Manufacture, buy, sell, let out on hire, purchase electrical goods and goods of all kinds, manufacturers of and dealers in radio and television sets, washing machines, radiators, etc. Cap.: £1,000. Dirs.: V. Buckley, Elphinstone; N. Douce; W. A. Beedham; and E. Wildbore.

Butagas (Wroxham) Ltd. Dealers in and suppliers of substances and materials of all kinds for heating and lighting, and appliances and installations used in connection therewith, etc. Nom. cap.: £100. Dirs.: T. M. Hagenbach and Mrs. J. K. Hagenbach, C. H. Roe and Kathleen Roe.

Fred Lee and Co. (Coventry), Ltd., Dover St, Coventry. Manufacturers of and dealers in jewels, horological, electric, marine and scientific instruments, etc. Nom. cap.: £100. Dirs.: F. Lee, H. Lee, and W. S. Heatley.

Spaxamatic Ltd. Agricultural, automobile, aircraft, electrical, mining, marine, motor, oil fuel, constructional and civil engineers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: E. Wax, 33 Haymarket, S.W.1, and Patricia D. Vallance, 2 Belgrave St, W.C.1.



HENLEY'S FIND the answer

FOR VERTICAL RUNS

It is no longer necessary to specify drained cables (with thicker insulation and greater cost) for vertical runs of 6 kV and 11 kV cable. Henley Fully Impregnated Non-Draining Cables provide the answer. They have the normal B.S.480 thickness of dielectric, and cost no more than standard cables. For the lower voltages too, and for use in mines (B.S.760), they offer all the advantages of a fully impregnated insulation but without risk of compound migration.

SPECIAL COMPOUND

HENLEY Fully Impregnated Non-Draining Cables are impregnated with a special non-migratory compound developed in the Henley Research Laboratories.

OPERATING TEMPERATURE

HENLEY Fully Impregnated Non-Draining Cables rated for a conductor temperature of 70°C are completely non-draining at normal working temperature, and having excellent thermal overload capacity are also non-draining at even higher temperatures.

IMPREGNATION OF DIELECTRIC

The dielectric is impregnated by a special process, and therefore possesses superior electrical properties to the drained type of cable from which excess compound has been removed.

JOINTING AND ACCESSORIES

The normal Henley accessories and jointing techniques used for other paper cables are suitable for the Henley Fully Impregnated Non-Draining Cables.

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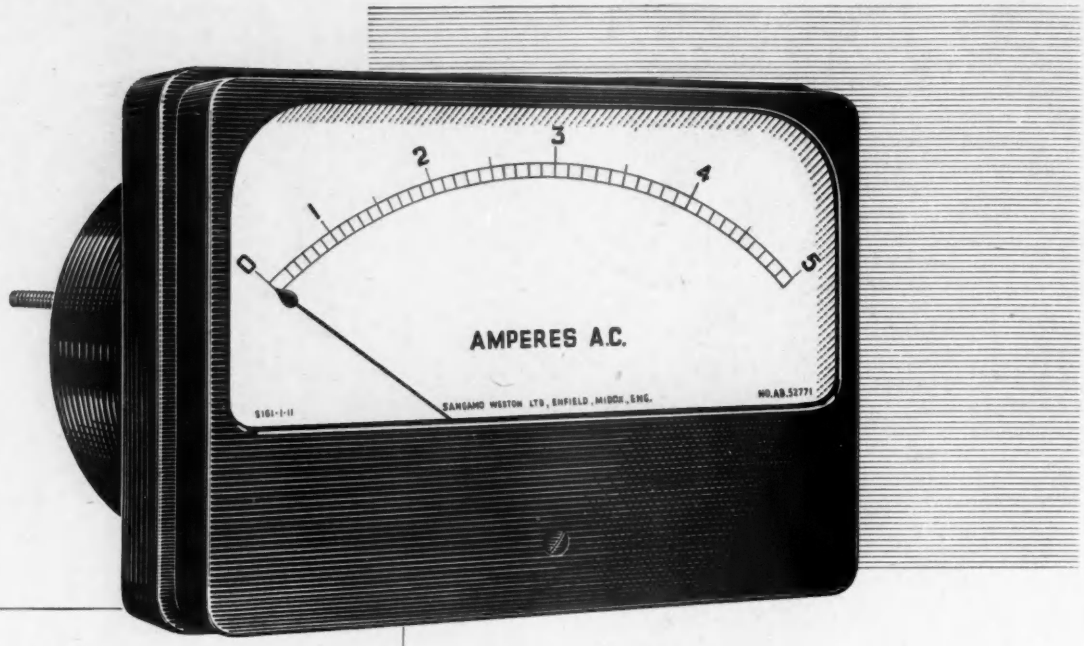
Fully Impregnated Non-Draining cables
– cannot bleed on vertical runs

No special accessories are needed. Available for standard voltages up to 11 kV in the normal range of finishes. For use in all normal situations and ideal for installation in factories, collieries, etc.

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53, HATTON GARDEN, LONDON, E.C.1



WESTON ELECTRICAL INSTRUMENTS INCLUDE:–

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SUB STANDARDS

FIRST GRADE PORTABLE INSTRUMENTS

ROUND, RECTANGULAR AND EDGEWISE SWITCHBOARD AND PANEL INSTRUMENTS

PORTABLE TEST SETS

RELAYS

AIRCRAFT INSTRUMENTS

THE WESTON RANGE OF RECTANGULAR INSTRUMENTS

These instruments, giving the advantage of long, easily read scales, are designed to harmonize with rectangular panels and are offered in a variety of types and scale ranges.

Supplied as D.C. moving coil, A.C. rectifier and H.F. thermocouple types; also A.C./D.C. moving iron types.

Four sizes are available with scale lengths of 2·5″, 3·2″, 4·2″ and 6·25″.

Front of panel or back of panel mounting may be adopted as desired and if the former method is used, there is complete interchangeability with existing round models.

The 3·2″ and 4·2″ scale instruments are available with either illuminated or non-illuminated dials; the 2·5″ and 6·25″ scale instruments being available only with non-illuminated dials.

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CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY OF BELFAST
Electricity Department

TENDERS are invited for the Supply, Delivery and Erection at Belfast Municipal Electric Power Station East of:

HEATING INSTALLATION
for the Workshop and Accommodation Building

Form of Tender (N.1401), Conditions, Specification and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas, which will be returned provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Accommodation Building Heating Installation, Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 12 Feb., 1954. An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
8 Jan., 1954. (G 361)

METROPOLITAN BOROUGH OF WANDSWORTH
SODIUM STREET LIGHTING

TENDERS are invited for the supply of 140 watt sodium electric discharge lamps and jackets.

Tender documents, obtainable from the Borough Engineer, must be returned to me by noon on Wednesday, 27 Jan., 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (G 320)

GOVERNMENT OF KUWAIT

THE GOVERNMENT of Kuwait invite tenders for 2—20,000 kW TURBO-ALTERNATORS for the new Power Station to be erected in Kuwait. The Specification will be available on the 14 Feb., 1954, for the submission of tenders by the 1 May, 1954. Specifications must be obtained from the President of the Electricity Department, Government of Kuwait, Kuwait, Persian Gulf, and will only be available to recognised and accredited Kuwaiti Agents. All further copies of the Specification will be issued by the Consulting Engineers in London at the request of the Government of Kuwait. Notice of the foregoing will be posted on the notice board of the Department of Electricity in Kuwait, on the 1 Feb., 1954.

EWBANK AND PARTNERS LTD.,
Engineering Consultants.

10/11 Grosvenor Place,
London, S.W.1. (G 340)

METROPOLITAN BOROUGH OF WANDSWORTH
STREET LIGHTING EQUIPMENT

TENDERS are invited for the supply of Group A. standard street lighting equipment with all ancillary gear, excluding sodium lamps and jackets.

Tender documents, obtainable from the Borough Engineer, must be returned to me by noon on Wednesday, 27 Jan., 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (G 319)

EGYPTIAN GOVERNMENT

TENDERS are called for by the Ministry of Public Works for the supply and erection at Abu-Zaabal Factory of eight Transformer Stations ranging from 400 kVA up to 1,600 kVA, 10,500 volts h.t. side, complete with h.t. underground cables 10·5 kV and l.t. underground cables for 380/220 volts.

Tenders should be submitted to: The Director-General, Mechanical and Electrical Department, Ministry of Public Works, Cairo, Egypt, not later than noon on the 6 Feb., 1954.

Copies of the necessary conditions of tender, specification, etc., can be obtained on application to the Chief Inspecting Engineer, Egyptian Government, 41 Tothill St, London, S.W.1, against remittance of £10. 5s. per set, which sum must be prepaid and is not returnable. Copies of these documents are also available for scrutiny at the above address. Cheques must be endorsed permitting transfer to an Egyptian Government account.

Reference No. 44/M. and E. 200/1/7/2 must be quoted in all correspondence.

(G 338)

CITY OF BELFAST
Electricity Department

TELEGRAPHS AND OPERATIONAL TELEPHONES

NOTICE is hereby given that the latest time for the receipt of Tenders for Telegraphs and Operational Telephones at Belfast Municipal Electric Power Station West (Form of Tender No. N.1485) has been extended from 4 p.m. on 1 Jan., 1954, until 4 P.M. on FRIDAY, 29 JAN., 1954.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
7 Jan., 1954. (G 362)

FRIERN BARNET URBAN DISTRICT COUNCIL
PUBLIC STREET LIGHTING

TENDERS are invited for the supply of street lighting lamps for the year commencing 1 April, 1954, of the following types:

(*a*) Metal filament lamps.
(*b*) Sodium vapour lamps and jackets.
(*c*) Mercury vapour lamps.

The Conditions of Contract, Specification and Form of Tender may be obtained from the Engineer and Surveyor, Town Hall, Friern Barnet, N.11.

Tenders must reach the undersigned not later than 9 a.m. on the 27 Jan., 1954.

The Council does not bind itself to accept the lowest or any tender.

B. R. OSTLER,
Clerk of the Council.

Town Hall,
Friern Barnet, N.11. (G 360)

BOROUGH OF HYTHE
STREET LIGHTING—TRUNK ROAD A.259
(Seabrook Road Section)

TENDERS are invited for all or any of the following works:

(*a*) Supply and Erection of 83 Pre-Cast Concrete Columns and Supply and Fitting and Wiring complete of 83 No. 400 watt Lanterns and Auxiliary Equipment.

(*b*) Supply and Erection of 83 No. Pre-Cast Concrete Columns—Fitting and Wiring complete of 83 No. Electric Lanterns (Lanterns to be supplied under separate Contract).

(*c*) Supply only of 83 No. 400 watt Mercury Discharge Lanterns and Auxiliary Equipment.

Plans and General Conditions of Contract may be inspected at the Borough Surveyor's Office, Municipal Offices, Hythe, and Specification, Bills of Quantities and Form of Tender obtained from him on payment of a deposit of £2. 2s., returnable on receipt of a bona fide Tender.

Tenders, in plain, sealed envelopes endorsed "Street Lighting—Seabrook Road A.259" are to be delivered to the undersigned not later than first post on Monday, 25 Jan., 1954.

Tenders are subject to the approval of the Ministry of Transport, and the Council does not bind itself to accept the lowest or any Tender.

R. B. SNOWDEN,
Town Clerk.

Municipal Offices,
Hythe, Kent. (G 313)

METROPOLITAN BOROUGH OF WANDSWORTH
STREET LIGHTING

TENDERS are invited for the supply and erection of concrete lamp columns, resiting existing steel columns, and the installation of all ancillary gear for Group A. standard street lighting.

Tender documents, obtainable from the Borough Engineer, must be returned to me by noon on Wednesday, 27 Jan., 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (G 318)

GOVERNMENT OF KUWAIT

THE GOVERNMENT of Kuwait invite tenders for 2—250,000 lb per hour evaporation STEAM RAISING UNITS for the new Power Station to be erected in Kuwait. The Specification will be available on the 14 Feb., 1954, for the submission of tenders by the 1 May, 1954. Specifications must be obtained from the President of the Electricity Department, Government of Kuwait, Kuwait, Persian Gulf, and will only be available to recognised and accredited Kuwaiti Agents. All further copies of the Specification will be issued by the Consulting Engineers in London at the request of the Government of Kuwait. Notice of the foregoing will be posted on the notice board of the Department of Electricity in Kuwait, on the 1 Feb., 1954.

EWBANK AND PARTNERS LTD.,
Engineering Consultants.

10/11 Grosvenor Place,
London, S.W.1. (G 341)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

OVERHEAD TRANSMISSION AND DISTRIBUTION LINES

TENDERS are invited for the construction of 33 kV, 11 kV and lower voltage wood pole Overhead Lines in the County of Sutherland.

Copies of the Tender Document may be obtained on application to the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1. Applications should be accompanied by a cheque for £2. 2s. (returnable).

The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3
8 Jan., 1954. (G 359)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Garry Moriston Transmission Lighting, Heating and Subsidiary Services Installation at Fort Augustus Group Control Centre

TENDERS are invited for the above installation. Copies of the Tender Document may be obtained from the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1, on receipt of a deposit of £2. 2s. (returnable).

The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3
7 Jan., 1954 (G 339)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER

Worthing District

SALARY £587—£600 per annum under N.J.B., Class E, Grade 9. Superannuable. Applicants should have Higher National Certificate or equivalent qualification in Electrical Engineering and experience in construction, operation and maintenance of overhead and underground distribution systems up to 33 kV. A knowledge of D.C./A.C. Changeover an advantage.

Applications, giving 2 referees, must reach M. J. Mortimer, M.I.E.E., Worthing District Manager, S.E.E. Board, 56, Chapel Rd, Worthing, by 25 Jan., 1954.

DISTRICT ENGINEER

Woking District

Salary £858—£894 per annum under N.J.B. Class E. Grade 3. Superannuable. Applicants, preferably corporate members of the I.E.E. should have experience in E.H.V. and L.V. distribution, design and practice, together with the ability to organise and control the activities of a district distribution department.

DISTRICT COMMERCIAL ENGINEER

Woking District

Salary £803—£834 per annum under N.J.B. Class E, Grade 4. Superannuable. Applicants must have had extensive experience in the electricity supply industry, including the organisation and control of a Commercial Department, together with experience in dealing with industrial consumers, tariffs, etc., and in the control of a large contracting department. Experience in the application of electricity in agriculture will be an advantage.

Preference will be given to Corporate Members of the Institution of Electrical Engineers or applicants holding equivalent qualifications.

Applications for these two Woking appointments to be made on forms obtainable from C. W. Hughes, B.SC., M.I.E.E., Surrey Manager, S.E.E. Board, Rough Rew, Horsham Rd, Dorking, Surrey, to be returned giving 2 referees by 29 Jan., 1954.

A. L. BURNELL,
Secretary.
(G 350)

SOUTH WESTERN ELECTRICITY BOARD

Bristol Central District

SENIOR SERVICE CENTRE ASSISTANT required. Applicants should possess extensive experience in salesmanship and display methods and have a wide knowledge of domestic and small industrial and commercial apparatus. Possession of E.D.A. Certificate in Salesmanship an advantage.

Salary N.J.C. Grade 3, £520 x £20—£580 per annum.

Applications on forms obtainable from Sub-Area Manager, South Western Electricity Board, Colston Avenue, Bristol, 1, should be returned to him not later than 29 Jan., 1954. (G 352)

ASSISTANT INSPECTING ENGINEERS

REQUIRED by the CROWN AGENTS FOR THE COLONIES for service primarily in the United Kingdom. Basic salary scale £650 x £25 to £750 x £30 to £900 a year plus Extra Duty Allowance of approximately 8%. Starting salary is linked to age, £650 at 25 with one increment for each additional year up to 34. Fully qualified officers at least 27 years old may be eligible for special salary increase of £75 after two years' service. Engagement on unestablished terms with prospect of appointment to the established staff and of promotion.

QUALIFICATIONS—candidates aged 25-40 should at least have passed the qualifying examination for Associate Membership of one of the major engineering institutions or equivalent, should have served an apprenticeship or pupilage and have had subsequent experience in one of the following categories:

Category 1. Locomotives, Rolling Stock.
Category 2. Motor vehicles, Diesel engines.
Category 3. Steel Structures, Permanent Way.
Category 4. Machine Tools, Cranes.
Category 5. Contractors Plant.
Category 6. Electric Power.

Write to the Crown Agents, 4 Millbank, London, S.W.1. Stating experience, category number (above), name in block letters, age, whether married or single, full qualifications, experience, knowledge of foreign languages, and quoting M2A/29418/EE. (G 351)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

REQUIRED, SECOND ASSISTANT STATION CHEMIST at Ferrybridge Power Station, near Knottingley.

Salary £607—£628 p.a. Class H, Grade 11 National Joint Board Agreement.

Applicants should hold a Higher National Certificate in Chemistry and have previous experience associated with the analysis and testing of fuels, water and oils.

Application forms, obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within fourteen days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(G 343)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 273/53—SHIFT CHARGE ENGINEER at Leigh Generating Station, Charles St, Leigh. Salary £559/586 (B.7).

Vacancy No. 1/54—SHIFT CHARGE ENGINEER at Chadderton L.P. Generating Station, near Oldham. Salary £649/681 (E.7).

Vacancy No. 2/54—DRAUGHTSMAN at No. 3 Sub-Division, located at Barton Generating Station, near Manchester. Salary £433/567 (6/D).

Vacancy No. 4/54—STATION SHIFT CONTROL ENGINEER at Accrington Generating Station. Salary £531/547 (D.10).

Vacancy No. 5/54—SHIFT CHARGE ENGINEER at Stockport Generating Station. Salary £697/718 (F.7).

Applications to Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 23 Jan. Quote vacancy No. (G 332)

ELECTRICAL AND MECHANICAL ENGINEER

REQUIRED by BASRAH PORT DIRECTORATE IRAQ for one year in first instance. Salary etc. I.D. 100 rising to I.D. 124 a month. (Iraqi dinar = £1). Provident Fund. Free passages. Liberal leave on full salary. Candidates, at least Grads. I.E.E. or equivalent, must be experienced in the operation of medium sized electricity undertakings and in erecting and maintenance of HT and LT overhead and underground systems, a.c. distribution systems and substation plant. Small diesel power station experience would be useful. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30334/EE. (G 310)

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT and GENERAL ASSISTANT ENGINEERS are required in the Distribution, Design, Construction, and Operation and Maintenance Sections. Candidates for Third Assistant Engineers should preferably be Corporate Members, and for General Assistant Engineers, Graduate Members, of the Institution of Electrical Engineers, or have other equivalent qualifications.

Applicants should have the necessary degree of experience appropriate to each post, of H.V. and L.V. overhead and underground transmission and distribution systems. Salary—Third Assistant Engineers, N.J.B. Class G, Grade 10, £608/630 per annum. General Assistant Engineers, N.J.B. Class G, Grade 13, £496/514 per annum.

NOTE: It is anticipated that on 1 Apl., 1954, the Sub-Area will be reclassified and the salary scale will then be £641/667 and £523/542 respectively.

Gainsborough District

GENERAL ASSISTANT DISTRICT ENGINEER

Qualifications as for General Assistant Engineer above with experience in the Construction and Operation and Maintenance of H.V. and L.V. overhead and underground distribution systems. Salarly—N.J.B. Class D, Grade 11, £500/£516 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 28 Jan., 1954.

No. 6 (Hull) Sub-Area

Bridlington District

THIRD ASSISTANT DISTRICT ENGINEER (Driffield)

Applicants should possess the Higher National Certificate in Electrical Engineering, or equivalent qualifications, and should have had experience in Planning, Estimating and Construction of overhead lines and substations, and in the operation of an extensive system in a rural area.

The successful candidate will be required to reside in Driffield or the immediate vicinity, and undertake standby duty. Salary—N.J.B. Class D, Grade 9, £561/578 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 28 Jan., 1954.

No. 5 (Wakefield) Sub-Area

Castleford District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications. Salary—N.J.B. Class E, Grade 11, £524/540 per annum.

Barnsley District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the District and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications. Salary—N.J.B. Class F, Grade 11, £548/565 per annum.

Applications, giving full details of age, qualifications and experience together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than 28 Jan., 1954. (G 335)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

SHIFT CHARGE ENGINEER is required at Newcastle Power Station, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule "A", Grade A7, commencing at £493 per annum.

A sound technical training is required and experience in the operation and maintenance of diesel generating units and main switchgear.

Apply on form AE6, quoting Vacancy No. 577 M.D., available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 30 Jan., 1954.

R. L. BATLEY,
Divisional Controller.
(G 349)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Essex Sub-Area

Chelmsford District
JUNIOR ENGINEER—4/54.R.

Candidates should have had a sound technical education, preferably to Higher National Certificate standard and some experience of H.V. and L.V. distribution systems. The salary will be in accordance with Class E, Grade 15, of the National Joint Board Salary Agreement, commencing at £390.

Apply to the District Manager, Chelmsford, Eastern Electricity Board, Anchor Street, Chelmsford, Essex.

Northmet Sub-Area

St. Albans and Welwyn Garden City District
SALES REPRESENTATIVE—1/54.R.

The duties will be advising consumers on commercial matters associated with supply, tariffs and apparatus sales, in accordance with the National Joint Council Agreement. The salary will be in accordance with Grade 1 (£380 x £20—£460 x £10—£470) of the National Joint Council Salary Agreement.

Apply to the District Manager, Eastern Electricity Board, Electricity Offices, St. Peter's Street, St. Albans, Herts.

Future salary and conditions of service for the above appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (G 348)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

DRAUGHTSMEN—
CONSTRUCTION DEPARTMENT
Section Leader Civil Engineering Design
Vacancy No. 4/54

Candidates should have experience in design and detail of heavy reinforced concrete structures, heavy foundations, retaining walls, bridges and the like.

Preference will be given to candidates who are corporate members of the Institute of Civil Engineers or equivalent qualifications.

Salary will be in accordance with Grade 3, £780—£884 per annum of Schedule D of the National Joint Board Agreement.

The closing date for this appointment 25 Jan., 1954.

Senior Draughtsmen and Engineering Draughtsmen
Vacancy No. 1/54

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

Engineering Draughtsmen (Mechanical)
Vacancy No. 2/54

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(i) Design and layout of Power Station equipment, including turbo - alternators, boiler plant, coal and ash plant, and general station auxiliaries.

(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.

(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567—£671 per annum) and Grade 6 (£433—£567 per annum) of Schedule D according to experience.

Engineering Draughtsmen (Electrical)
Vacancy No. 3/54

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. Switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

GENERAL ASSISTANT ENGINEER
Transmission (Construction) Department
Vacancy No. 6/54

Applicants must have had considerable experience in the field of all stages of 132 kV overhead line construction and/or civil works in 132 kV Substations. It would be an advantage if applicants possess qualifications leading to Corporate Membership of the Institutions of Civil or Mechanical Engineers.

Salary will be in accordance with Class AX/DX, Grade 8 (£501—£694 per annum) of the National Joint Board Agreement.

The closing date for this appointment is 28 Jan., 1954.

GENERAL ASSISTANT ENGINEER
(Section)
Vacancy No. 7/54

Candidates must have had experience in the maintenance and operation of 132 kV transformers, switchgear and overhead lines in a Transmission Section. The position will be located at Nottingham Section.

The salary will be in accordance with Class AX/DX, Grade 6 (£584—£787 per annum) of the National Joint Board Agreement.

The closing date for this appointment is 23 Jan., 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(G 345)

BRITISH ELECTRICITY AUTHORITY

HEADQUARTERS London, require a SENIOR ASSISTANT ENGINEER (COOLING TOWERS) in the Generation Plant Design Sub-Branch. Duties consist of general investigation into the technical and economic aspect of cooling tower design, together with the preparation of specifications and critical assessments of the technical features and performance of specific designs. Candidates should preferably hold an Honours Degree in Engineering, and should have a sound knowledge of the fundamentals of the cooling process, proven capacity for original thought, and experience either in the design office of a manufacturer of cooling towers or of economic studies in relation to the design of central power stations. Civil Engineering knowledge would be an advantage.

Salary N.J.B., Grade 1, £1,002-£1,378 p.a. inclusive. Applications stating age, qualifications and experience, present position and salary to D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London W.1, by 30 Jan., 1954. Quote reference E.T./437. (G 314)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

(1) SYSTEM CONTROL ENGINEER (SHIFT) in the No. 4/5 Sub-Area Operation Department based on the Control Centre at Legacy, near Wrexham. Salary £680/£706 p.a. (N.J.B. Class J, Grade 10).

Duties, which will be on a continuous shift basis, will be those normally associated with switching operations and load transfers on an extensive E.H.V. system inter-connecting 132/33 kV injection points and a number of hydro-electric stations.

Applicants should have had operational experience in distribution work and in substations. Possession of the technical qualifications necessary to enable them to become Chartered Electrical Engineers advantageous.

(2) ASSISTANT SECTION ENGINEER in the Aberystwyth District of the Board's No. 4/5 Sub-Area. Salary £532/£551 p.a. (N.J.B. C/9).

Applicants should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers, and have had experience in the H.V. and M.V. overhead and underground distribution work.

The appointments are superannuable and subject to medical examination. Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date: 25 Jan., 1954. (G 322)

TECHNICAL INSTRUCTOR (ELECTRICAL)

REQUIRED by the NIGERIAN GOVERNMENT Education Department for two tours of 15 to 24 months or three tours of 10 to 12 months with prospect of permanency. Commencing salary etc. according to experience in scale £750 rising to £1,175 a year. Outfit allowance £60. Free passages for the officer and wife and assistance towards cost of children's passages or their maintenance in this country. Liberal leave on full salary. Candidates under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They should possess recognised technological qualifications and have had experience in apprentice training.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/29963/EE. (G 333)

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of a PRINCIPAL ASSISTANT in the Secretary's Department, Wayleaves and Agreements Section, at the Board's Headquarters, Newcastle upon Tyne.

Applicants must be of proved administrative ability and have had training and practical experience in the negotiation of wayleaves, preferably in the Electricity Supply Industry and in the assessment of agricultural damage. Knowledge of urban property valuation and negotiations is also desirable. Salary Grade 8, £865/970 per annum, and conditions of service in accordance with N.J.C. (Administrative and Clerical Grades) Agreement for Electricity Supply Industry.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), Carliol House, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (G 353)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

SHIFT CHARGE ENGINEER, Canterbury Power Station. Applicants should have had suitable technical training and experience in the operation of power station plant and E.H.T. switchgear. The possession of an Ordinary National Certificate would be of advantage. N.J.B. Conditions of Service and salary Class B Grade 7—£559 per annum. Applications giving details of education, present position, experience, etc., should be received by Station Superintendent, Canterbury Power Station, Kingsmead Rd, Northgate, Canterbury, Kent, by 23 Jan. (G 346)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF GENERAL ASSISTANT ENGINEER

No. 2 Sub-Area Testing Station, Walkden

APPLICANTS should be experienced in laboratory testing of all types of polyphase metering equipments and laboratory and site testing of protective gear. Experience in testing and installation of industrial metering equipments will be an advantage. Technical education up to N.H.C. standard is essential.

Salary Scale: £616/646 p.a. Grade L.13. N.J.B. Conditions.

APPOINTMENT OF 2ND ASSISTANT ENGINEER

(Operation and Maintenance), Sub-Area Mains Engineer's Department, Bolton

Applicants should be experienced in the operation and maintenance of all transmission and distribution work up to and including 33 kV, together with the maintenance of substations and substation equipment for all high voltages.

Salary Scale: £926/966 p.a. Grade L.1. N.J.B. Conditions.

Applications for above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester, by 30 Jan., 1954.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER

(Protective Gear Testing), Sub-Area Technical Engineer's Department, Preston

The person appointed will be engaged mainly on the testing and maintenance of Protective Gear; experience of relays or meters is desirable but not essential.

The possession of the H.N.C. or equivalent, in Electrical Engineering would be an advantage.

Salary Scale: £616/646 p.a. Grade L.13. N.J.B. Conditions.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER

Preston District

Duties will include general assistance in all activities connected with the utilisation of electricity for domestic, commercial, agricultural and industrial purposes.

Possession of the O.N.C. in Electrical Engineering would be an advantage.

Salary Scale: £548/565 p.a. Grade F.11. N.J.B. Conditions.

Applications for the above posts to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41, Lune St, Preston, by 30 Jan., 1954 (G 344)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Corporate Membership of the I.E.E. or I.Mech.E. for post (*a*) and Graduate Membership for post (*b*) an advantage.

(a) BOILER HOUSE SUPERINTENDENT

Fulham Generating Station

Sound mechanical and electrical training with First Class technical background. Wide experience necessary in efficient operation and maintenance of large modern operating plant and auxiliary equipment. Ability to plan and organise work to strict time schedule. Experience in Power Station's labour relations policy, modern concept of management essential. Salary—Class L, Grade 6=£1,046. 17s. p.a.

(b) BOILER HOUSE SHIFT CHARGE ENGINEER

Taylors Lane Generating Station

Experience in operation of modern high pressure boiler plant, together with sound electrical knowledge. Salary—Class F, Grade 9=£637. 7s. p.a.

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (G 334)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

South Western Division

STATION CHEMIST required at East Yelland Generating Station.

Superannuation Scheme. Salary, N.J.B. Class "G," Grade 7, £729—£758. (Ultimate classification Class "H".)

Applicants should be experienced in Fuel, Oil, and Water testing. Familiar with and capable of taking part in investigations and carrying out performance tests. Recognised degree in Chemistry required.

Applications on Form A.E.6/ACT, obtainable from Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 30 Jan., 1954. (G 321)

A SUPERVISOR (wiring installation work) required for Air Ministry internal wiring and other work. Must be used to handling jobs from start to finish including ordering and final billing. Fine opportunity for capable, hardworking engineer to secure progressive post with ultimate possibility of Directorship with old established concern. Apply in confidence stating age, experience and commencing salary, Box No. 3181, Electrical Times. (G 323)

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade, salary scale £1,000 to £1,320, (*b*) Assistant Grade £650 to £1,000. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long-term possibilities. Special allowance up to £1,300 a year according to location payable in addition to salary during overseas service. Candidates must be natural-born British subjects of natural-born British parents.

MINIMUM qualifications and experience for both grades of posts: (i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two-year apprenticeship or (*b*) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms quoting reference D1/54A from M.L. and N.S., Technical and Scientific Register (K), Almack House, King St, London, S.W.1. (G 354)

CABLE JOINTER, fully experienced in jointing cables up to 11 kV, for the Middle East. Write stating experience, and give References or names to whom we may apply, also state age to Box No. 3165, Electrical Times. (G 274)

CAPABLE SENIOR DRAUGHTSMAN required for design of 11 kV metal-clad switchgear equipment. The position offers good prospects. House available to right man. Superannuation scheme. Applications giving full particulars of previous experience, qualifications and salary required to the Personnel Manager, South Wales Switchgear Ltd, Blackwood, Mon. (G 311)

ELECTRICAL ENGINEER required to deal with matters relating to the use of copper and copper alloys for electrical purposes. Candidates must be Corporate members of the Institution of Electrical Engineers and have had good practical experience, preferably including some experience of overhead lines. Commencing salary £800 per annum upwards according to qualifications, plus superannuation. Applications stating age, details of training and experience should be marked "Personal" and addressed to the General Manager, Copper Development Association, Kendals Hall, Radlett, Herts. (G 272)

DRAUGHTSMEN, Electrical, required, with experience of schematics, wiring diagrams, panels, etc., and, preferably, knowledge of electrical installation on railway rolling stock. Applications, with details and salary required, to Personnel Manager, J. Stone & Co. (Deptford) Ltd., London, S.E.14. (G 324)

ELECTRICAL DRAUGHTSMEN with good experience in cable, power and lighting installation layouts for heavy industrial works. Salaries in accordance with experience and ability. Staff Profit Sharing Scheme and Pension Fund after twelve months' service. Canteen facilities available. Apply, stating age and full particulars of experience in chronological order, to: The Chief Engineer, The Associated Portland Cement Manufacturers Ltd., Portland House, Tothill St, Westminster, London, S.W.1. (G 275)

ELECTRICAL FOREMAN required for staff job with newly established company with H.Q. in London area. Experience in contracting work essential. City and Guilds or similar qualification preferred. Box No. 3179, Electrical Times. (G 315)

ELECTRICAL MAINTENANCE CHARGEHAND. A chargehand is required for the Electrical Maintenance Department of this factory. Applications are invited from time served electricians who have had experience of similar work, and in supervision. Preference will be given to those possessing recognised technical qualifications. Staff appointment with contributory Pension Scheme. Applications, giving full personal, educational, service and industrial experience details, and quoting reference E/EMC, to Personnel Manager, Ferodo Limited, Chapel-en-le-Frith, Via Stockport, Cheshire. (G 316)

ELECTRICAL/MECHANICAL ENGINEERING ASSISTANT required by Hayes and Harlington U.D.C. Salary APT. Va—£625 to £685 plus London "Weighting." Pref. given to holders of Higher Nat. Cert. of one or other of the Institutions of Mechanical or Electrical Engineers. Candidates should have experience in street lighting, illuminating engineering, the operation and maintenance of motor transport. Application form from Engineer and Surveyor, Town Hall, Hayes, Middx., to be returned by 1 Feb., 1954. (G 317)

ELECTRONICS ENGINEER required to handle design and development of industrial and special purpose electronic equipment. Supervisory experience an advantage. Qualifications and experience must be up to A.M.I.E.E. standard. Permanent, progressive position. Non-contributory pension, insurance and sickness benefit plan. Apply by letter to the Personnel Department, Kodak Ltd., Wealdstone, Middx. (G 325)

G.E.C. Stanmore Laboratories invite applications for the following vacancies for work on guided missile research. Excellent working conditions in modern well equipped laboratories.

(i) SENIOR DESIGNER with considerable experience in electronic circuitry work. (Ref. ET/WHG.1.)

(ii) STRESSMAN with experience in airborne radar and similar equipment. (Ref. ET/WHG.2.)

(iii) DESIGNERS with Engineering Degrees or equivalent qualifications possessing initiative and originality, experienced in one or more of the following (Ref. ET/WHG.3.):

(a) Small mechanisms; (b) Gyroscope techniques; (c) Small high pressure hydraulic actuators (excellent prospects for man with the required experience); (d) Mechanical design of miniature electric machines and servo-motors.

Applications should be made in writing to the Staff Manager, G.E.C. Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middx., stating age, qualifications and experience and quoting the appropriate reference number. (G 336)

JUNIOR ELECTRICAL DRAUGHTSMAN required. Experience in the field of general distribution and utilisation. Qualifications must be up to Ordinary National Certificate or equivalent in electrical engineering. Applicants should have served recognised apprenticeship. Permanent, progressive position. Non-contributory pension, insurance and sickness benefit plan. Apply by letter to the Personnel Department, Kodak Ltd., Wealdstone, Middx. (G 326)

MAINTENANCE FOREMAN ELECTRICAL required by The English Electric Co., Ltd., for new factory at Stevenage, Herts. To be experienced in the installation and maintenance of electrical services in an engineering factory. House available if required for applicant from the Greater London area. Please apply in writing to The English Electric Co., Ltd., The Airport, Luton, Beds, quoting Ref. No. P.884. (G 258)

MAINTENANCE ENGINEER (MECHANICAL) with good technical qualifications required for 80 MW industrial Power Station. Age not less than thirty or over fifty. Commencing Salary £800 to £900. Non-contributory Pension Scheme. Up-to-date Power Station experience essential. Apply in writing to Salaried Personnel Department, Ford Motor Company Limited, Dagenham, Essex. (G 327)

MAJOR oil company requires immediately for employment in Venezuela, South America, ELECTRICAL ENGINEERS, preferably with 5 to 10 years' oilfield experience, for the maintenance/construction high power distribution system, cable/open wiring, transformer stations, power and light installations in buildings, shops, pump installations, houses, etc. In addition candidates should possess an electrical engineering diploma with a minimum of H.N.C. Approximate age 30/38 years, single or married. Salary according to qualifications and past experience. Travelling expenses paid for interviews in London. Please write first instance giving full details age, qualifications, experience and marital status, to Box Z.X.863 Deacon's Advertising (below).

ALSO required, ELECTRICAL ENGINEERS for power plant and construction systems with preferably at least six years' experience operating/maintenance power plant, electrical installations, also transmission systems. Must have electrical engineering diploma with minimum G.I.E.E. Approximate age 25/35 years, single or married. Write giving full details to Box Z.Y.864, Deacon's Advertising, 36 Leadenhall St, London, E.C.3. (G 355)

POWER PRODUCTION ENGINEER required for the Jamaica Public Service Company. Duties will involve the supervision of operation and maintenance of approximately 30 MW of steam power plant, 12 MW of hydro power plant and 4 MW of diesel power plant. Applicants must possess good engineering background with experience in the operation and maintenance of H.P. turbine plant and auxiliaries and also be capable of planning and programming the maintenance of the plant. Efficient operation and control of expenditure will be a major responsibility of the appointment. Experience with hydro and diesel Power Stations will be advantageous. Applicants should have held a position of at least a Deputy Station Superintendent in the U.K. Applicants must also have had a full technical training and preference will be given to those possessing recognised qualifications in electrical or mechanical engineering. A good salary will be offered to suitable applicants. The successful applicant will have to enter into a three year contract agreement. Free passage out and home will be provided for the successful applicant, also his wife and family. Leave will be granted at the rate of three months after three years service at full overseas salary. Applications in writing should, in the first place, be addressed to The Secretary, Ewbank & Partners Limited, Engineering Consultants, 10/11 Grosvenor Place, London S.W.1. (G 300)

PRODUCTION MANAGER required for new Telephone Cable Factory. Applicants must have first-class practical experience in the manufacture of all types of underground telephone cables and possess good knowledge of modern works administration. Progressive position with excellent prospects. Applications, which will be treated in strict confidence, to Scottish Cables Ltd., Renfrew, Scotland. (G 357)

PROGRESS IN MANUFACTURING METHODS and techniques in connection with a wide range of products from heavy power station equipment to electronic apparatus and development work on the products themselves, have led to several interesting vacancies in The English Electric Co. Ltd., Stafford, for MANUFACTURING or METHODS ENGINEERS and PRODUCT DEVELOPMENT ENGINEERS. Applications are invited from engineers working in either of these capacities and from those who have a sound background of practical experience in a manufacturing industry, at least O.N.C., and a desire to enter either of these important branches of engineering. Please write, giving full details of qualifications and experience and quoting Ref. S.A. 36, to Dept. C.P.S., 336-7 Strand, W.C.2. (G 234)

SENIOR ELECTRICAL DRAUGHTSMAN required with experience in the field of general distribution and utilisation. Qualifications and experience should be Grade I.E.E. standard. Permanent, progressive position. Non-contributory pension, insurance and sickness benefit plan. Apply by letter to the Personnel Department, Kodak Ltd., Wealdstone, Middx. (G 328)

TELEPHONE CABLE TECHNICIAN required for new factory. Applicants, preferably with degree but not essential, must have first-class experience in design and testing of all classes of telecommunication cables. Applications, which will be treated in strict confidence, to Scottish Cables Ltd., Renfrew, Scotland. (G 356)

THE ENGLISH ELECTRIC CO., LTD., require a SENIOR DEMONSTRATOR for the Northern Area (not including Scotland) to be based on Leeds or Manchester. Good sales experience and domestic science background required, together with knowledge of domestic electrical appliances, and ability to supervise and administer other demonstrators. Please reply, quoting ref. 1027D to Dept. C.P.S., 336/7 Strand, W.C.2. (G 329)

THE ENGLISH ELECTRIC CO., Stafford, has interesting vacancies for ENGINEERS to assist in the preparation of comprehensive tenders and contracts for hydro-electric schemes. Applications are invited from those having experience of this type of work and also from young engineering graduates or H.N.C. holders, who have a background of practical engineering experience, preferably with a commercial bias. Please apply to Dept. C.P.S., 336-7 Strand, W.C.2, quoting Ref. 756A. (G 235)

WANTED—for a Lode Mine in Malaya an ASSISTANT ELECTRICAL ENGINEER, age 22/24, with sound practical training and good technical knowledge in the care and maintenance of A.C. motors and switchgear. Salary Straits $400, $425 and $450 per month over a 3 year initial agreement plus cost of living allowance. Free furnished quarters and medical attention. Passage paid. Provident Fund. Applications with details of experience, and copies of references to Box No. 1069, c/o Abbott Ltd., 32 Eastcheap, London E.C.3. (G 302)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (G 13)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95, Park Lane, Leeds, 1. (G 20)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (G 17)

WANTED

A SIN: ph: GEARED MOTOR abt. 1 h.p. 230/250 V. Output r.p.m. 50/100. With slide rails. Price, Condition and Particulars to: W. H. Rose, 134 Aldwick Rd, Bognor Regis. (G 363)

A.C.-D.C. MOTORS, STARTERS, complete changeover installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Rd, Chiswick Pk, W.4. Tel.: Chiswick 5105. (G 8)

GOOD modern transformer type WELDING EQUIPMENT, 400/3/50. Box No. 3185, Electrical Times. (G 337)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. (G 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (G 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (G 2)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (G 6)

FOR SALE

ALTERNATORS, 665 kVA (500 kW Revolving field ALTERNATOR by Siemens. Type 819 UR, for 5,000/3/50. Open type, with bell shields, underslung yoke, direct coupled Exciter 250 volts. Speed 333 r.p.m.

625 kVA, Revolving field ALTERNATOR by E.E.C. for 440/3/50, 4 wire supply, with direct coupled Exciter 17·5 kW 50 volts. Speed 600 r.p.m.

600 kVA 480 kW, revolving field ALTERNATOR by E.E.C. for 400/3/50, with direct coupled Exciter Generator. Speed 600 r.p.m.

385 kVA, 308 kW, revolving field ALTERNATOR by L.D.M. for 400/3/50, 0·8 p.f., open type with direct coupled Exciter. Speed 600 r.p.m.

350 kVA, revolving field ALTERNATOR by Mather & Platt, for 400/3/50, 0·8 p.f. Open type with direct coupled Exciter. Speed 750 r.p.m.

George Cohen Sons & Co., Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (G 304)

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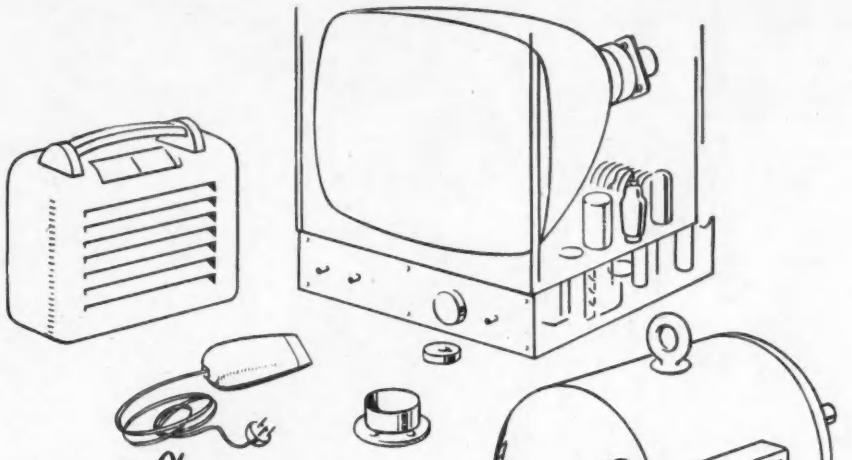

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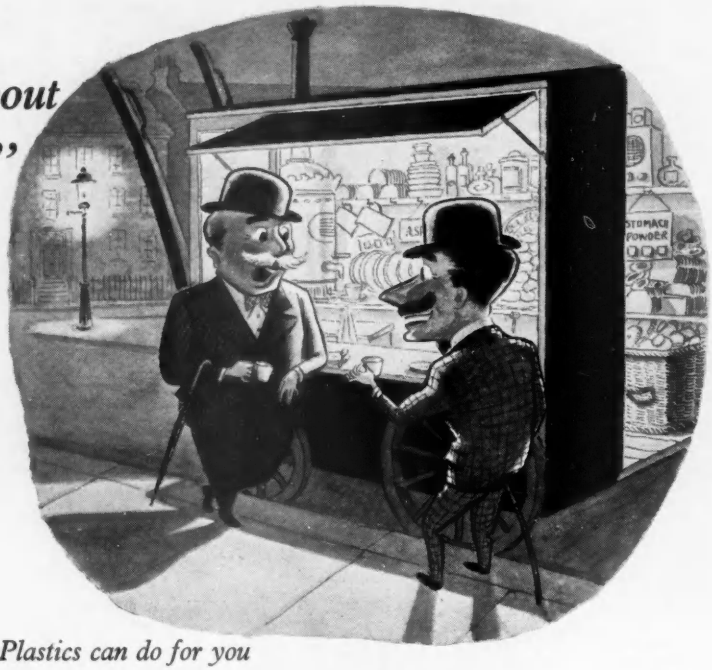

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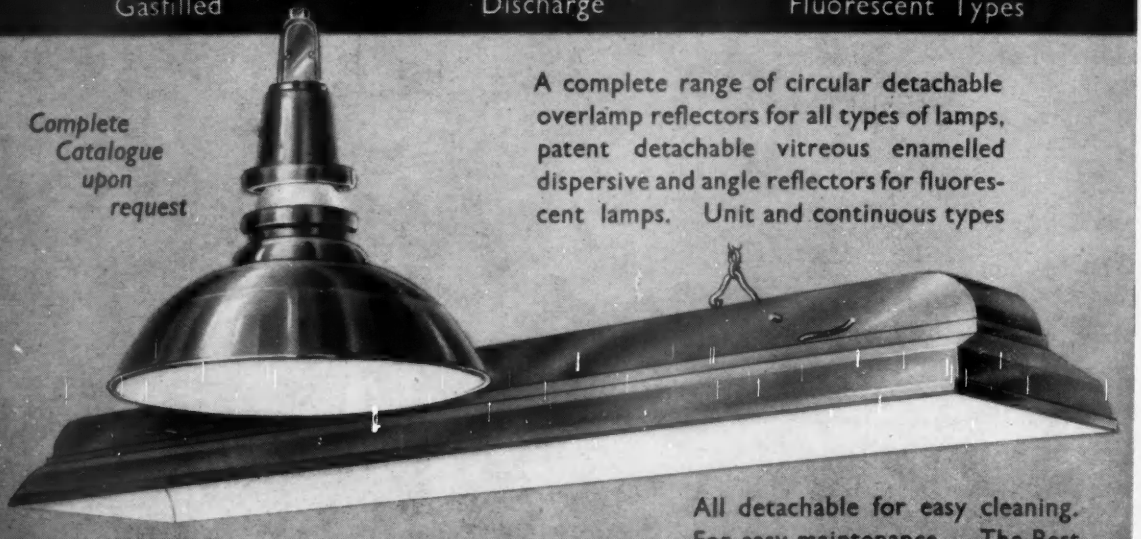

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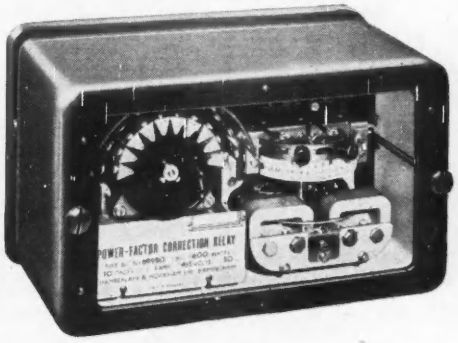

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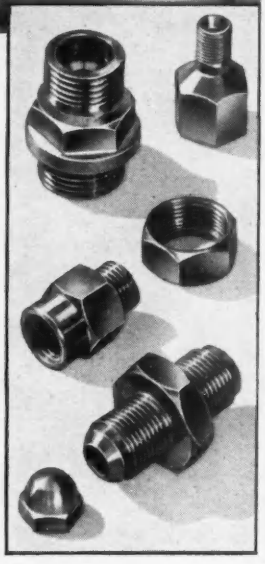

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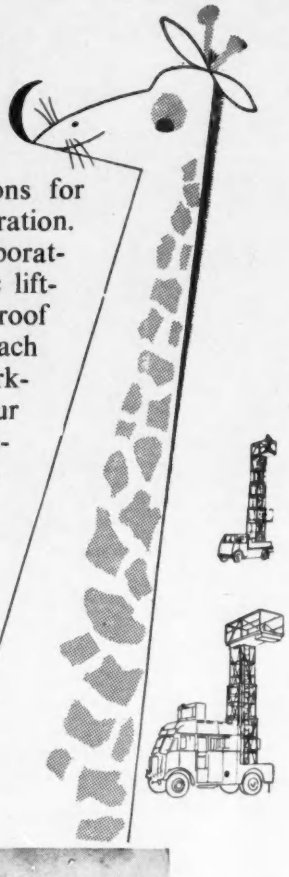

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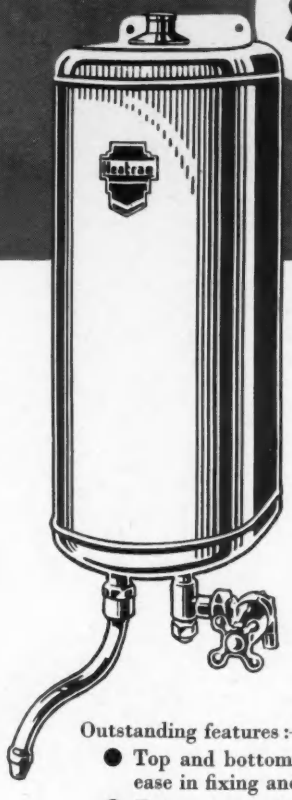

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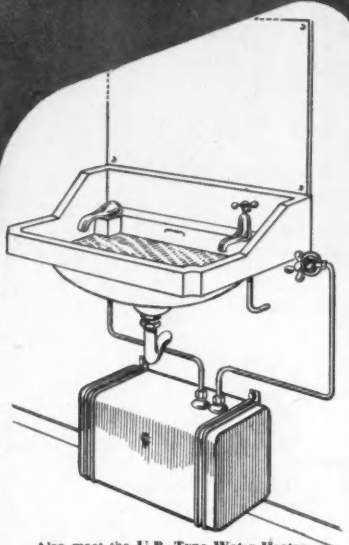

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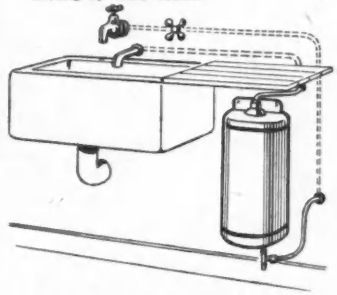

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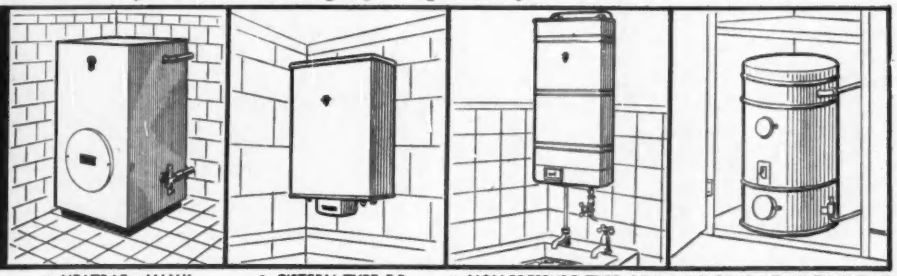

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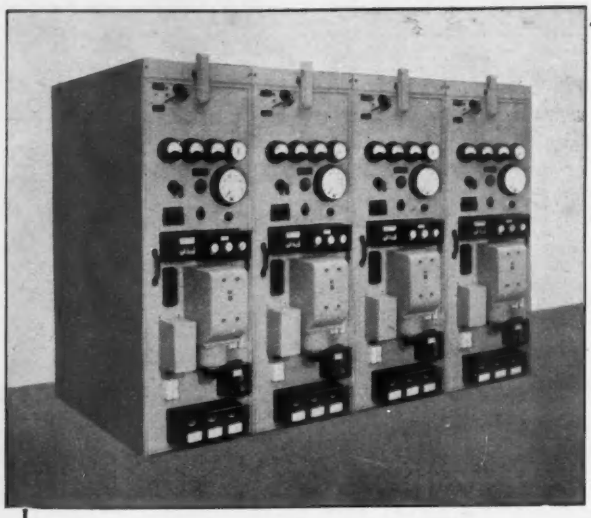

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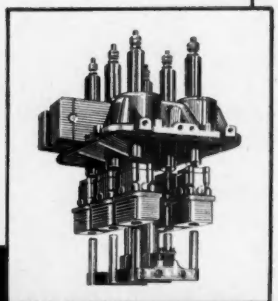

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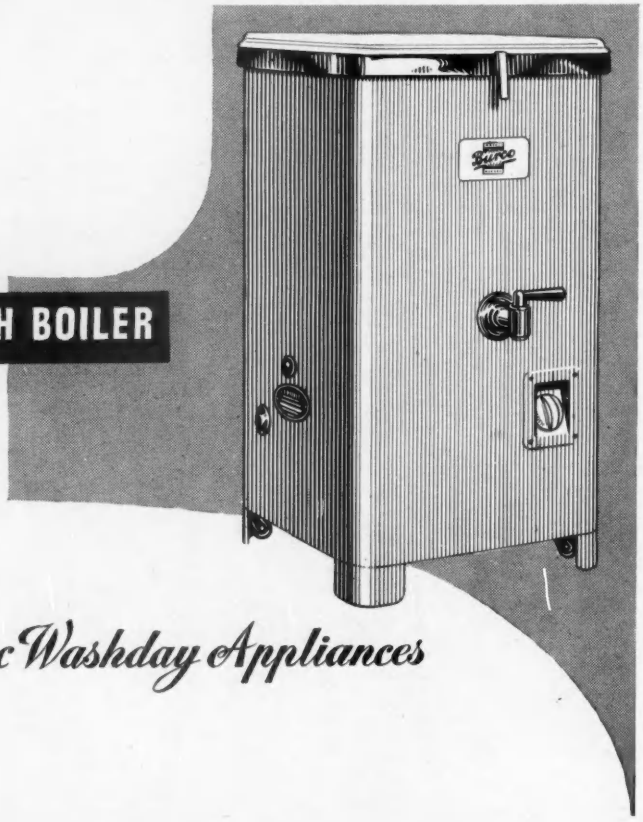

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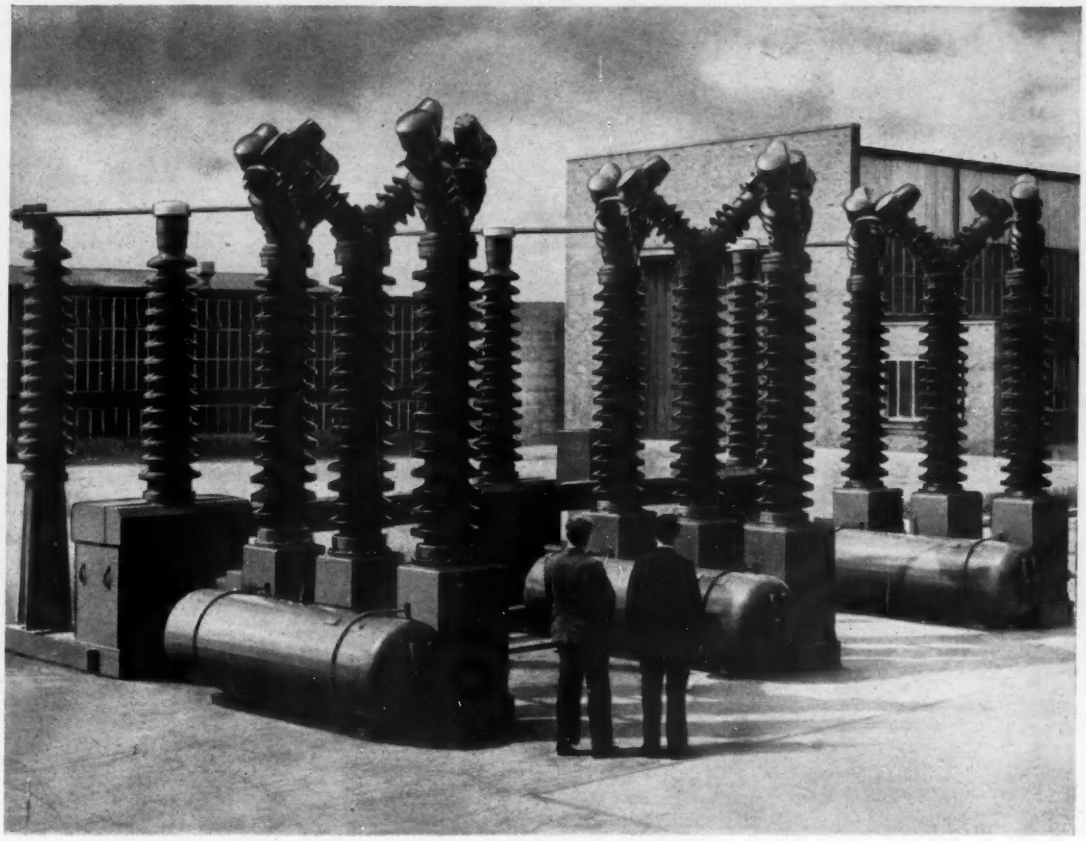

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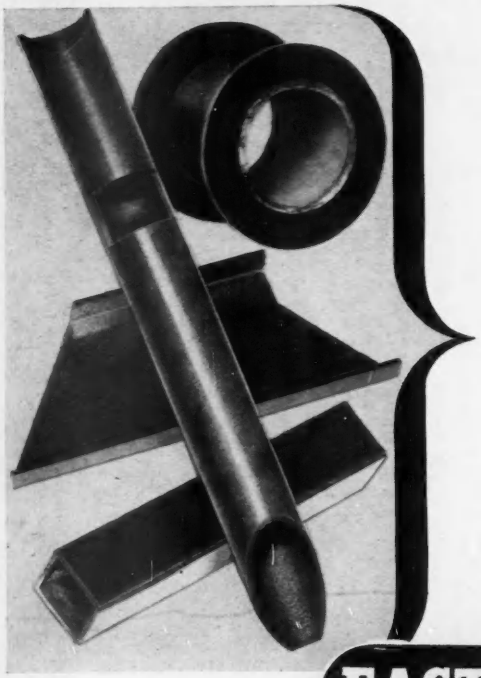

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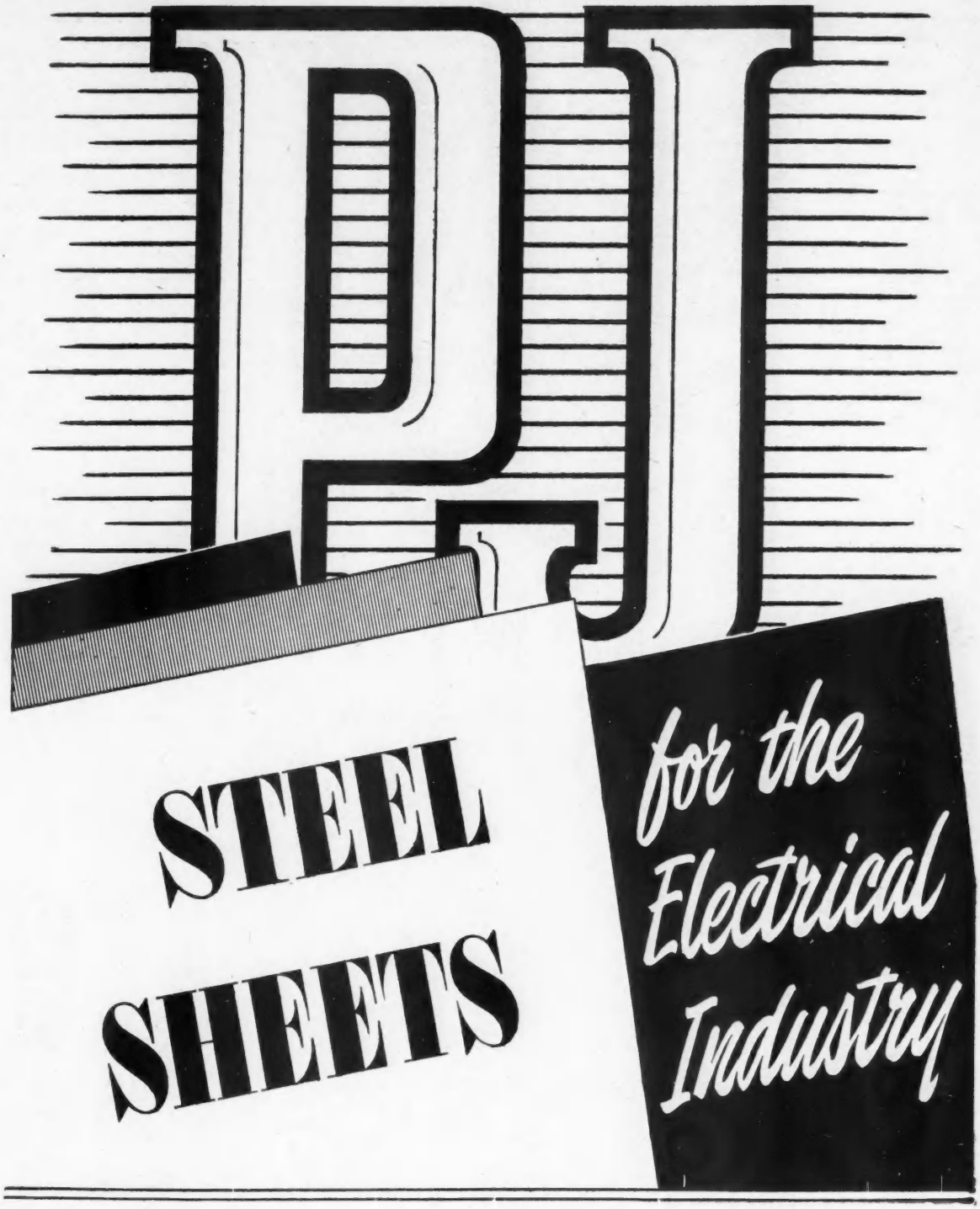

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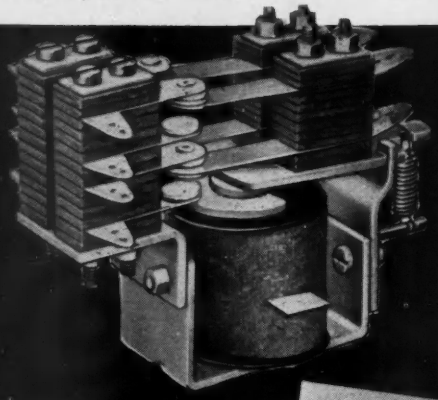

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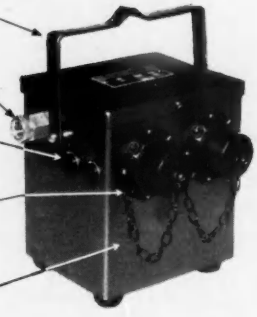

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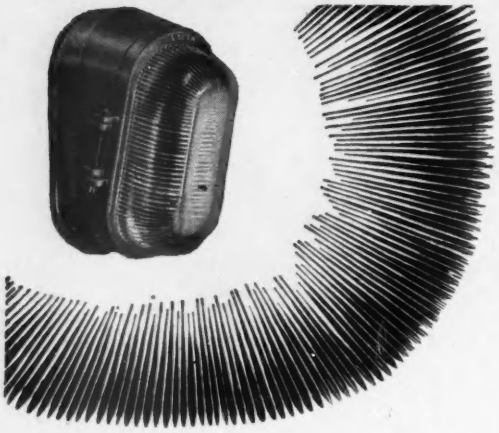

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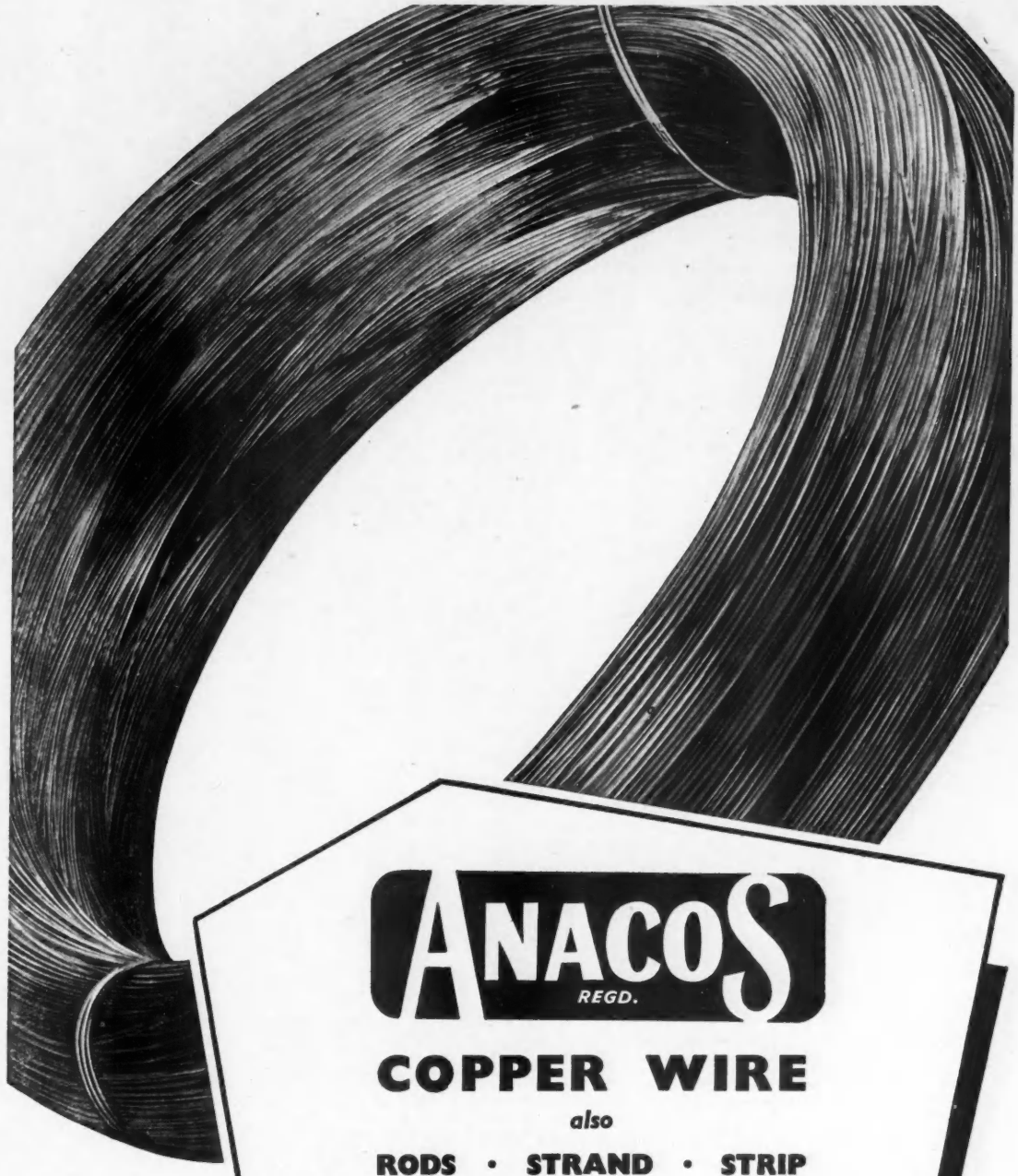

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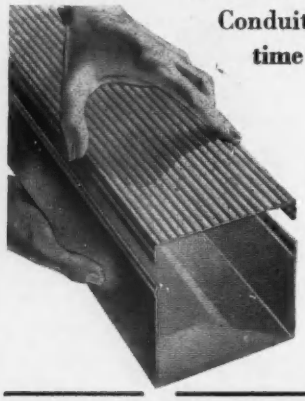

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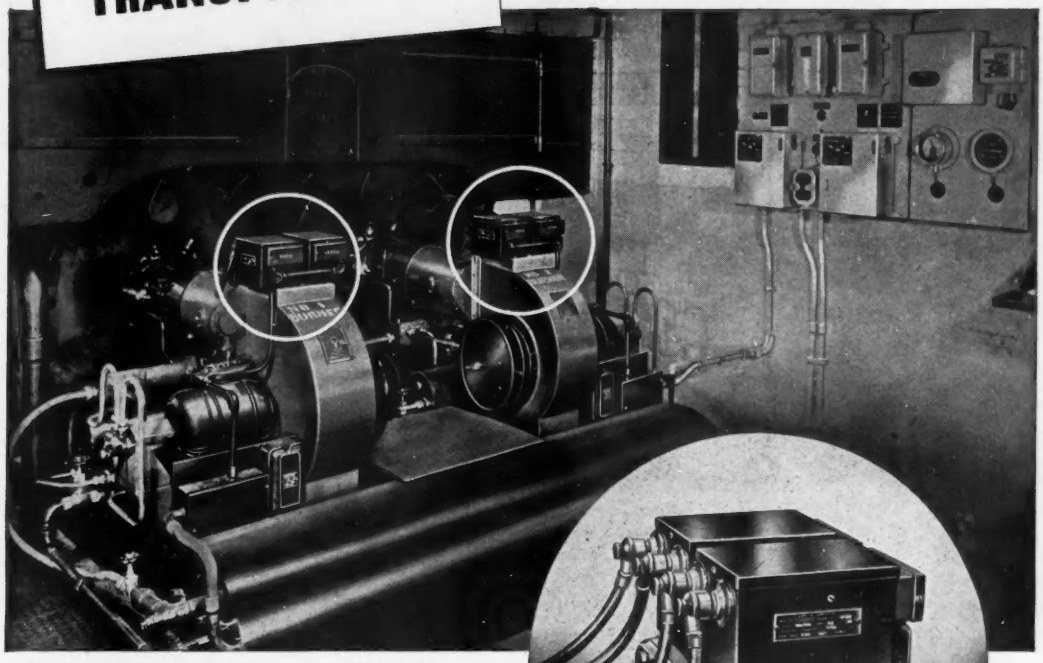

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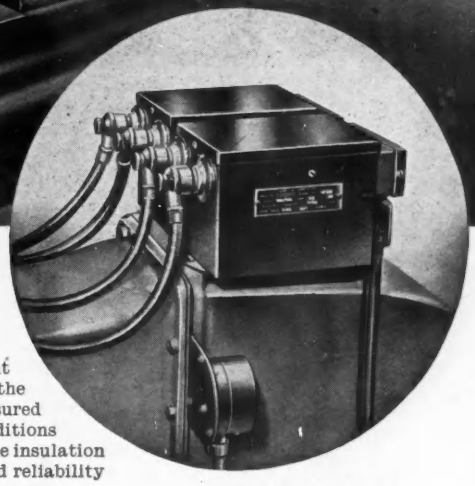

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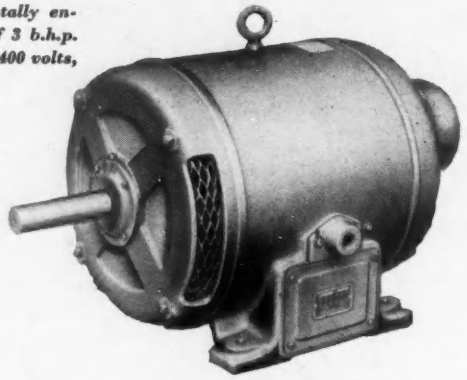

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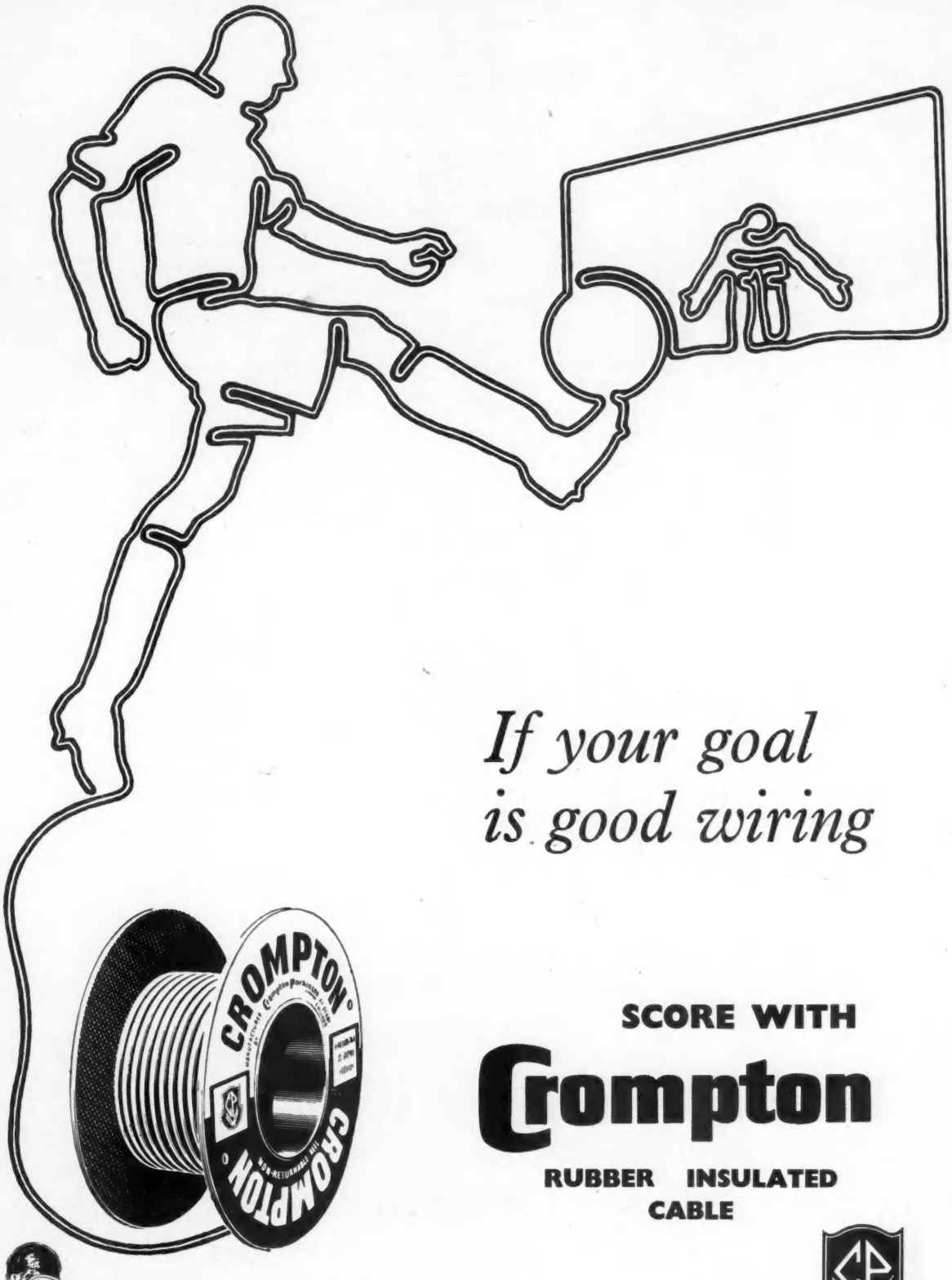

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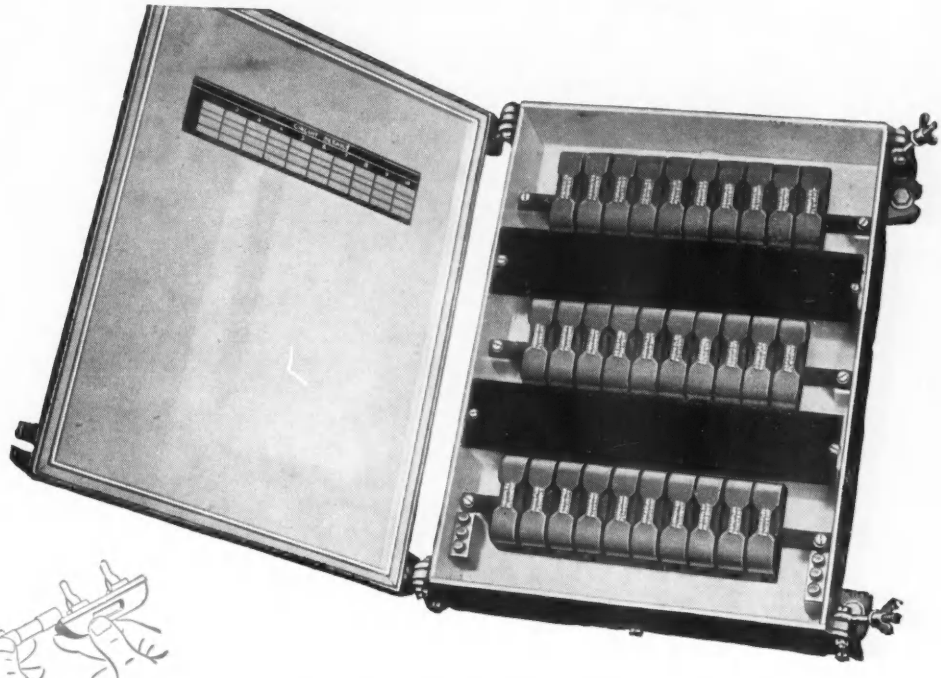

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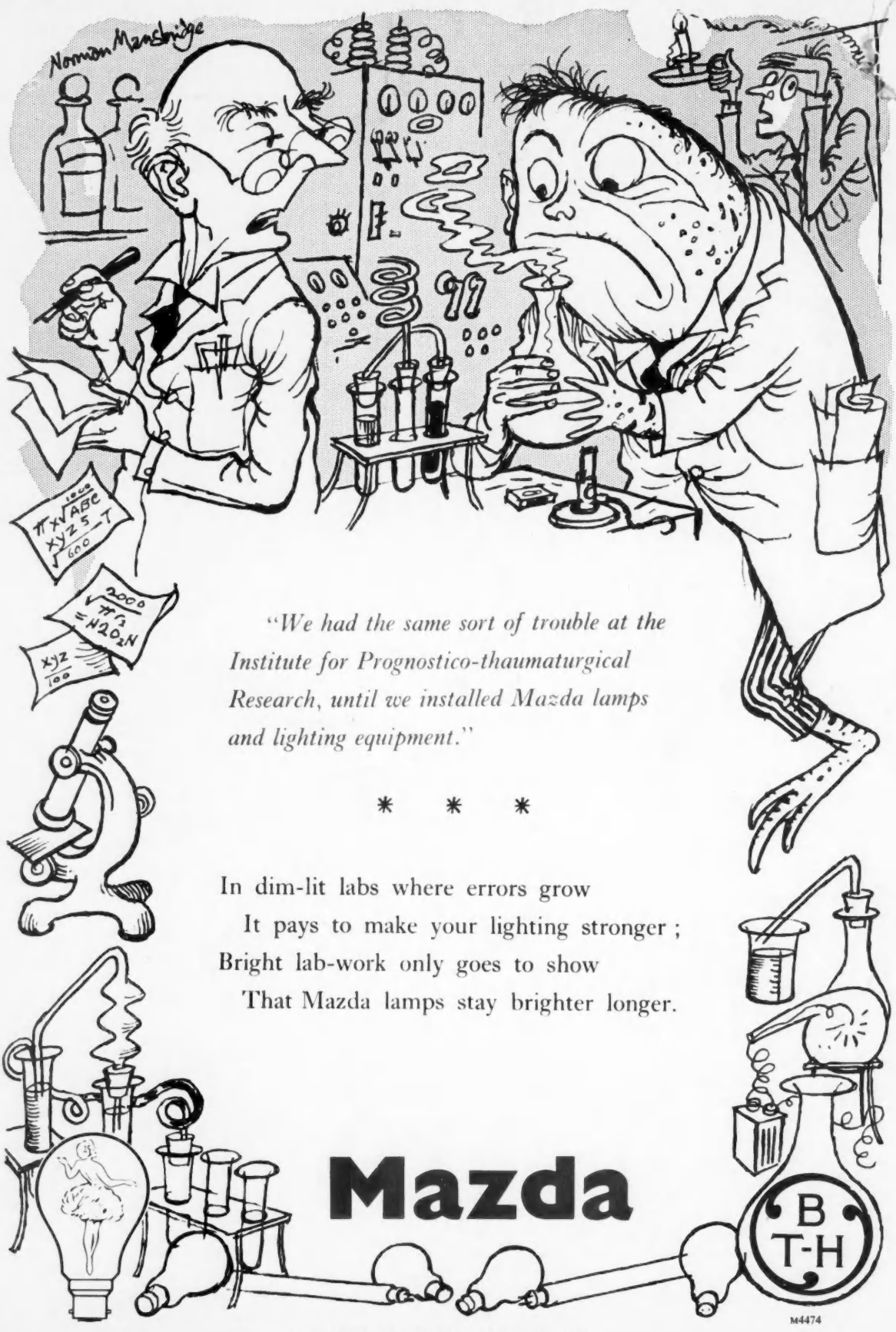

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